September, 1944

THE FOUNDRY

FIFTY-THIRD YEAR

PUBLIC LIBRARY
AUG 31 1944
DETROIT

FOUNDRY SAND . . .
writes THE WAY!

Our way to victory is literally paved with sand-cast products. In Pacific jungles, Normandy beaches or Italian hills—in fact, wherever fighting goes on—are castings made in sand bonded with Federal Green Bond—the best of the bentonites. There's over 17 years experience behind every bag.

Federal GREEN *Bond*

THE FEDERAL FOUNDRY SUPPLY COMPANY

4600 East 71st Street • Cleveland 5, Ohio

KHILL, W. VA. • CHICAGO • CHATTANOOGA, TENN. • DETROIT • MILWAUKEE • MINNEAPOLIS • NEW YORK • ST. LOUIS • RICHMOND, VA. • UPTON, WYO.

99% pure fused soda ash molded into 2-lb. pigs, PURITE is easy-to-use and effective in action. Pigs are simply added to ladle or cupola by count. No weighing or measuring. No loss or dust. PURITE is safe and economical to use.

SHIPPED IN 100-LB. BAGS AND BULK CARLOADS

IMPROVE STRENGTH and MACHINABILITY OF CASTINGS

For better cupola operations with hotter metal and less oxidation of the iron and metalloids in the charge, use Purite. This scientific flux removes impurities and prevents segregation defects. In both cupola and ladle, Purite increases the fluidity and pouring qualities of the molten metal, speeding production of sounder castings.

Ask your foundry supply house for a copy of Mathieson Bulletin P-41, "Refining and Desulphurizing Cupola Iron with Purite."

PURITE

99% PURE FUSED SODA ASH

THE SCIENTIFIC FLUX FOR BETTER MELTING & CLEANER IRON

Mathieson
CHEMICALS

THE MATHIESON ALKALI WORKS (INC.)
60 EAST 42nd STREET, NEW YORK 17, N. Y.
(Licensee of Metallurgical Development Company, Inc.)
In Canada: Railway & Power Engineering Corporation, Limited

TECHNOLOGY DEPT.

Cylinder Forgings

for swarms of planes

They glow softly red, bobbing gently as the hook conveyor carries them along overhead from the furnace. They look like old-fashioned Chinese lanterns at a garden party. But they are making the war anything but a garden party for Messrs. Hitler and Tojo. These lantern-like shapes traveling through Bethlehem shops are alloy-steel airplane-cylinder forgings.

In the cylinders is generated the power that carries fighters and bombers through the skies of Europe and the Pacific. The cylinders must endure tremendous pressure and intense heat, and stand up under hour-after-hour operation at terrific speeds. That calls for fine steel; steel that is very strong and homogeneous, and with a "heat history" that certifies its suitability for the job.

But to establish its soundness and fitness beyond any doubt, airplane-cylinder steel is repeatedly tested and inspected, during the steel-making and forging processes, throughout the complex series of heat treatments and in the final machining.

When plans were made for a gigantic U. S. Air Force, Bethlehem was assigned to produce a major part of the cylinder forgings. Manufacturing and handling procedures were worked out to produce these highly-specialized forgings on a mass-production basis. New machinery was installed and an entire additional plant constructed.

Our output of cylinder forgings climbed steadily, as the airplane-building program gained momentum. Now cylinder production is more than ten times as large as it was at the beginning of the war emergency. There are more Bethlehem cylinders flying against the enemy than cylinders made by all other manufacturers put together.

WORLD'S LARGEST SHIPBUILDER

★ ★ BETHLEHEM STEEL ★ ★

SECOND LARGEST STEEL PRODUCER

YOU CAN GET MORE CORES—BETTER CORES—FASTER
WITH A FEDERAL

VIBRA-DRAW

CORE DRAWING MACHINE...

Shown with air vibrator—can be used with either air or electric vibrator.

FAST...

Designed for speed, the Vibra-Draw Core Drawing Machine will definitely increase production in your core room. Production schedules can be maintained even with inexperienced operators.

ACCURATE

The core box is drawn against machined grooves (not cast). Accuracy is ensured for the entire height of the draw and every core will be true-to-box.

EFFICIENT

All the vibration is in the drawing head—none on the core tray. The stand supporting the core tray is independent from the balance of the machine. Cores already made will not "shake down" while others are being drawn on the same tray.

Write FOR CIRCULAR AND INFORMATION TODAY

THE FEDERAL FOUNDRY SUPPLY COMPANY

4600 East 71st Street • Cleveland 5, Ohio

Sand and Plant
CROWN HILL, W. VA. • CHICAGO • CHATTANOOGA, TENN. • DETROIT • MILWAUKEE • MINNEAPOLIS • NEW YORK • ST. LOUIS • RICHMOND, VA. • UPTON, KY.

THE FOUNDRY

for SEPTEMBER 1944

VOLUME 72 NUMBER 9

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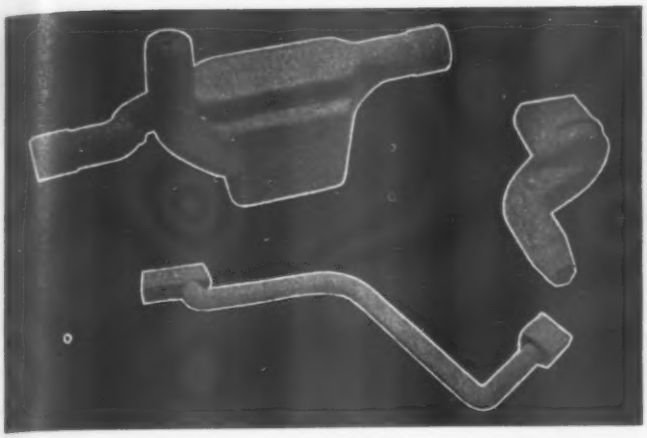
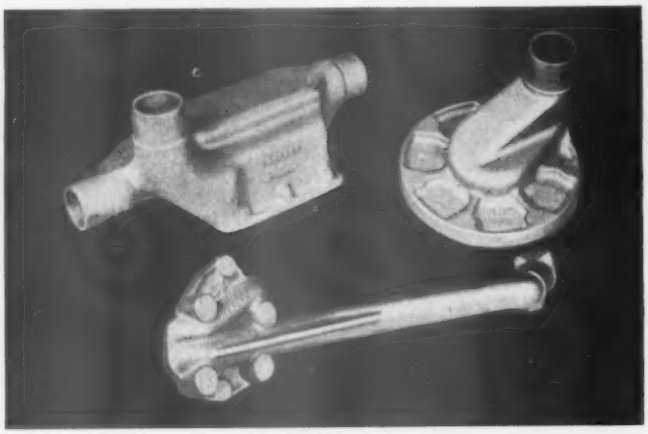
100 YEARS

THE A. C. WILLIAMS COMPANY, RAVENNA, OHIO, OBSERVES HUNDREDTH ANNIVERSARY IN THE FOUNDRY BUSINESS.

FROM bootjacks and other neighborhood needs to essential parts for heavy trucks and halftracs being rushed to the war fronts of the world, this is the story of the first 100 years of The A. C. Williams Company. In 1844 Ohio was backwood agricultural and the need was for plow points, wagon skeins, bootscrapers. Time moves on and the type of castings change, recording in iron the needs and notions of a country growing up. This is America. The story of 100 years is all interestingly set forth in a centennial booklet. The Williams Company decided that an essential "must" of economical foundry operation was uniform core oil and after investigation chose Linoil. That was fifteen years ago and they are still using Linoil. They have found Linoil uniform and suited to their war and peace needs.

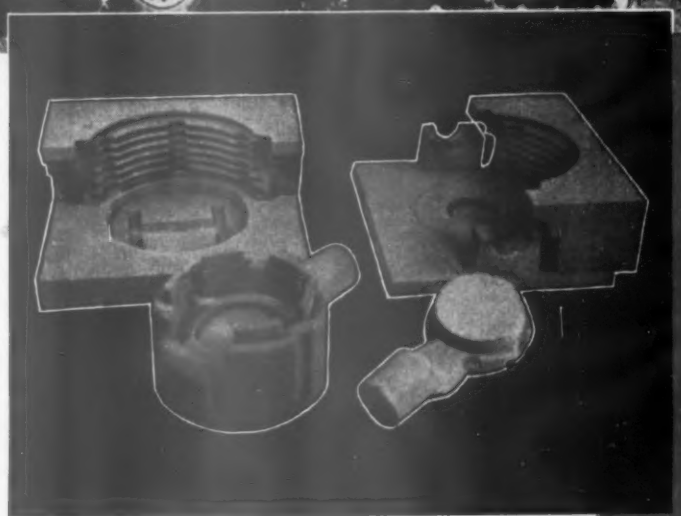
THE WERNER CO.
(DIVISION OF ARCHER-
2191 WEST 110 STREET WOODBINE





"Our experience with Werner G. Smith Linoil has been very satisfactory. It is particularly suited to the complicated core jobs where gas is a major problem, and strength and uniformity a necessity."—A. C. Williams Co.

LINOIL

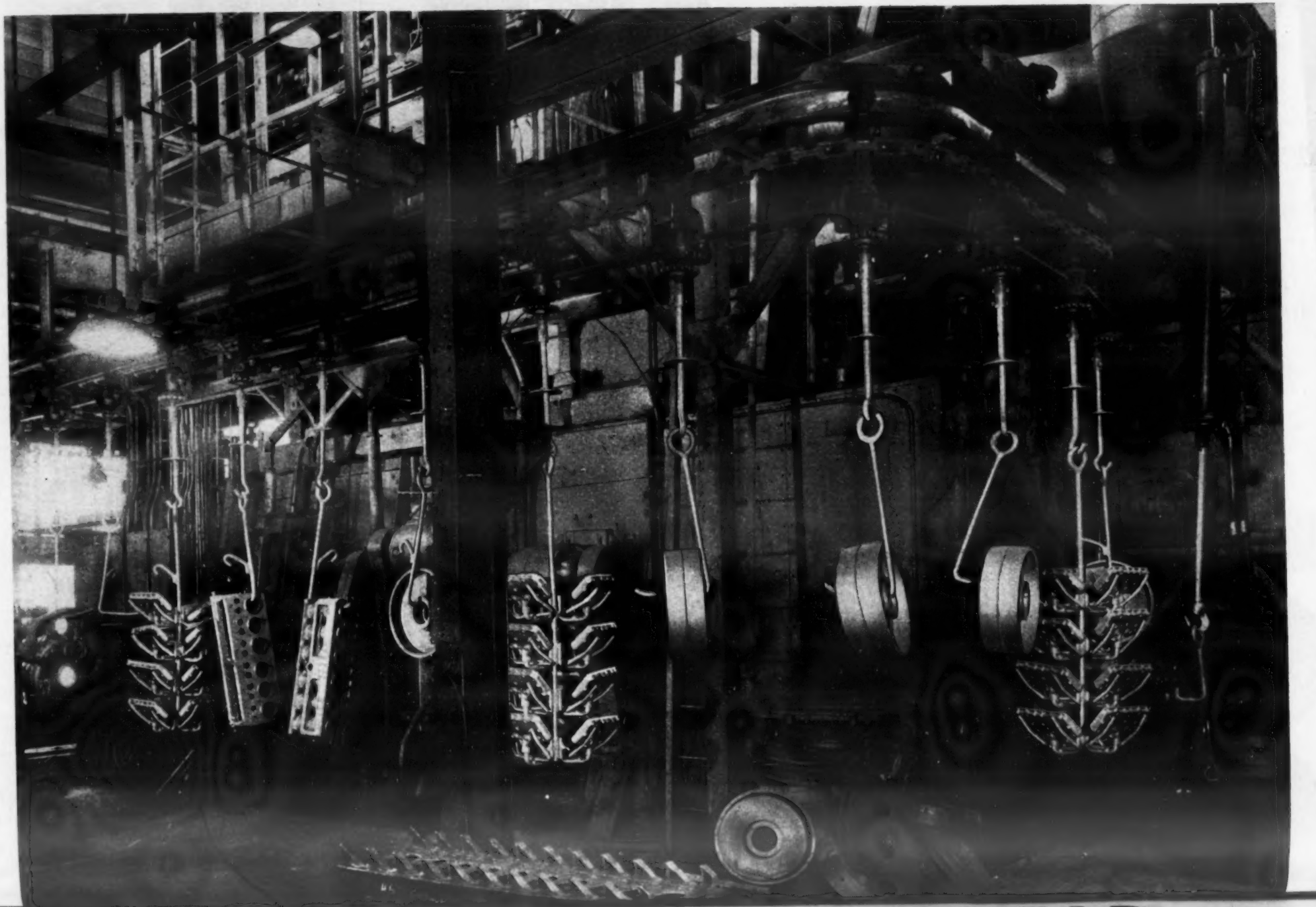


Linoil is a foundry man's core oil—the kind he can get his core room set up on and then forget about. After you have used absolutely uniform core oil for a time you just take it for granted and its use becomes second nature. You know with hardly a thought any change of ratio needed for a different type of core. Core oil problems are not Linoil users' problems—in fact, Linoil users pretty well forget what core oil problems are. It pays to be a Linoil user and to be worry free.

SMITH COMPANY

DANIELS - MIDLAND COMPANY)

4690 CLEVELAND 2, OHIO



SOMEONE MUST PLAN AHEAD . . .

SOME ONE MUST PLAN AHEAD . . .
WHY NOT YOU?

AIRLESS
ROTOBLAST
CLEANING

• A simple mechanical method of cleaning scale and sand from castings, forgings and heat treated parts without the use of compressed air. Cleaning is accomplished by centrifugal force—with ROTOBLAST* units throwing up to 28,000 pounds of steel abrasive per hour when powered by 20 HP motors. This new abrading efficiency reduces costs as much as 50% to 90% over former cleaning methods. ROTOBLAST units are adapted to

BARRELS • TABLES
SPECIAL MACHINES

Bulletins showing standard sizes and types available upon request.

**Trade mark of Pangborn Corporation for airless blast cleaning.*

70.3% of all metal working plants in the U. S. expect to reconvert to peacetime production immediately after the war's end. Another 16.6% expect to be reconverted to civilian requirements one month later.*

Worn ragged by demands for more and more war equipment for far-flung armies, many foundries will revamp their cleaning departments immediately after the war.

This is good manufacturing strategy. New parts, new Pangborn equipment may be the way to put your foundry in front in post war competition. You should KNOW THE FACTS — to GUESS is to ERR. Some one must plan ahead, why not YOU? Our Engineers will be glad to come out to see you NOW and discuss your plans for the future. No obligation, of course. For post-war preparedness "COME TO PANGBORN."

**Data compiled by Steel Magazine*

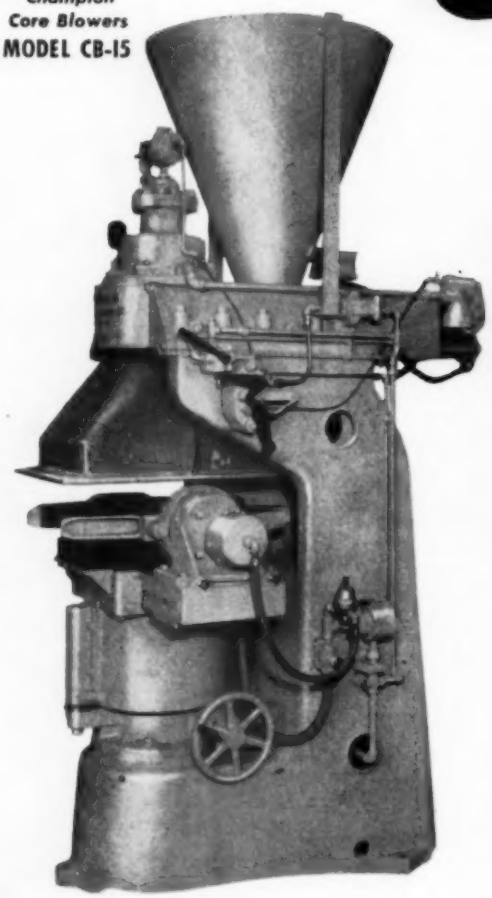
WORLD'S LARGEST MANUFACTURER OF BLAST CLEANING AND DUST CONTROL EQUIPMENT

PANGBORN

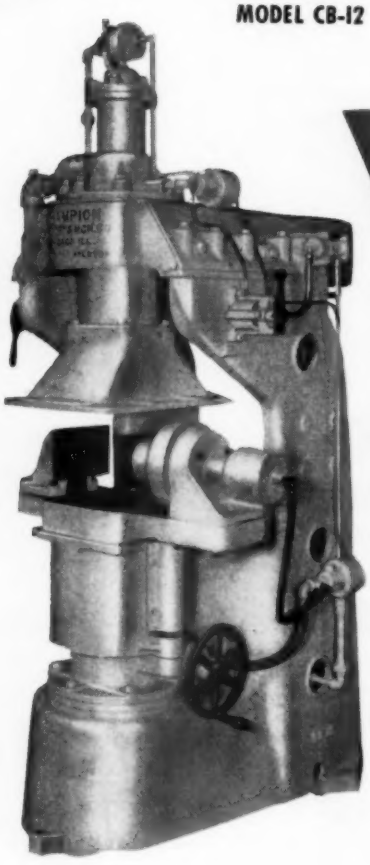
PANGBORN CORPORATION . . . . . HAGERSTOWN, MARYLAND

FOUNDRYMEN from Coast to Coast are thrilled by CHAMPION "Knowhow"

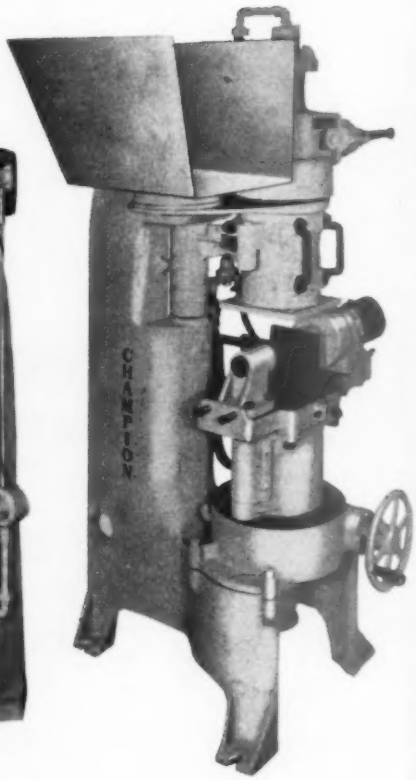
Champion Core Blowers MODEL CB-15



Champion Core Blowers MODEL CB-12



Champion Core Blowers MODEL CB-8

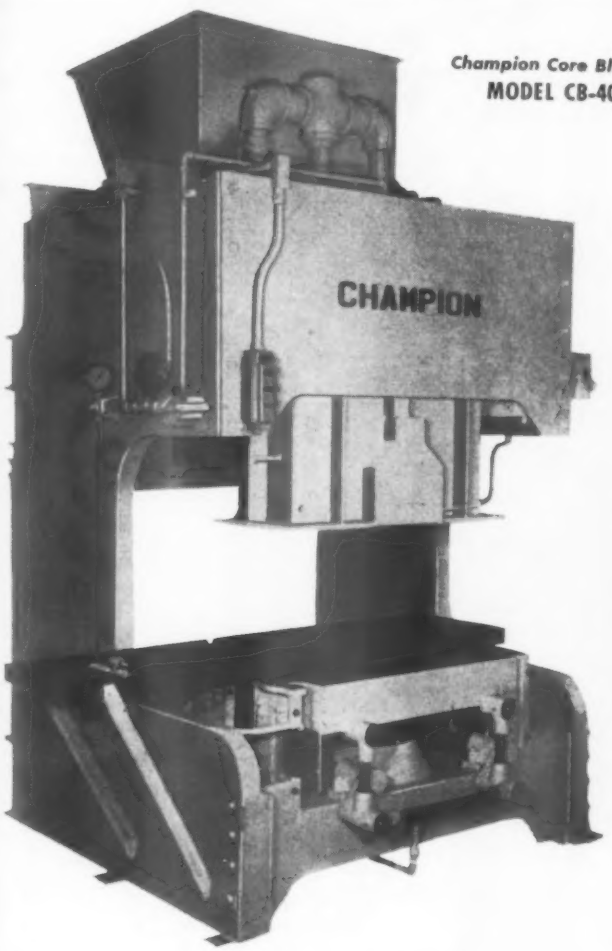


Performance under the stress and strain of today's demand for accelerated production of perfectly rammed cores is the test of a true Champion—a top-notch tool with the "know how" or "savvy" to remove all guesswork.

That is how a Champion Core Blower performs for the least experienced operator. Any man or woman—boy or girl can produce perfectly rammed cores on a Champion Core Blower by merely setting the box and pulling the lever. In a single second small or large cores are perfectly rammed. The working table is completely accessible with no obstructions, so that cores are produced faster, more economically and more accurately without need for highly trained labor.

A single valve operates the core box clamp, clamps same against the blow plate, blows the core, exhausts and releases the clamps in the proper cycle. Rigid one-piece, cast steel frame insures accurate alignment of core box and blow plate. Patented Air-Operated Hydraulic Clamp locks the core box securely against split box separation.

Champion Core Blowers could be the answer to that most puzzling problem of man-power.



Champion Core Blowers
MODEL CB-400

CHAMPION
FOUNDRY & MACHINE CO.
1318 West 21st Street Chicago 8, Illinois

SIMPSON MIXERS the foundation

No. 2 of a Series

WHAT MAKES THE SIMPSON MIXER BETTER

★water funnel
for correct water and oil additions.

chilled iron★ muller face
five years minimum guarantee.

★rocker arm principle
full mulling, no grinding.

★variable muller weight
changeable to suit your conditions.

high carbon★ crib
for flexible maximum capacity and safety.

smearing★ muller action
forward and sideways skid.

★sand sampler
for safety and ease in sand testing.

neco plows★
long wear and wide range adjustability.

★anti-friction equipped
all heavy duty production equipment.

bottom★ discharge
for safety, convenience and multiplicity.

sectional★ wearplate
for safety, maintenance and mulling efficiency.

★integrally mounted motor
lowest horsepower per ton of sand.

steel base★
built to suit your conditions.

★unit drive
integral mounting, anti-friction, helical gearing.

# of better sand control . . .

THE SIMPSON MIXER IS BETTER BECAUSE every detail of its construction has been carefully worked out, then proved in actual use . . . in hundreds of installations . . . in all types of foundries. For more than thirty years, National engineers have concentrated on a single purpose — to design and build mixers and related equipment for better and more economical preparation of foundry sand. No other factor has disturbed this objective. Today, more than thirty-two hundred Simpson Mixers serving some seventeen hundred foundries in the United States and Canada . . . plus thousands of other Simpson Mixers in use throughout the world . . . are proof of this better construction.

Its rugged simplicity, requiring a minimum of power for the size batch and type of material used, insures many years of uninterrupted service . . . low parts replacement costs. Enclosed gearing, stationary pan, enclosed crib, material sampler, and allowance for complete hooding and exhaust make the Simpson Mixer the safest mixer built.

Because of the bottom discharge and closely-set plows, the Simpson Mixer is virtually self-cleaning. No costly apparatus is needed to force the mix out of the pan . . . the plows automatically clear the mixer when discharge doors are opened.

Long-life, chilled iron mullers are hinged by rocker arms to the crosshead . . . ride over the mix . . . provide mulling rather than grinding — mix, but do not pulverize. Neco metal plows stand up under hundreds of hours of abrasive wear. Both mullers and plows are easily adjustable. Because it has a stationary crib, the Simpson Mixer requires one-third less power.

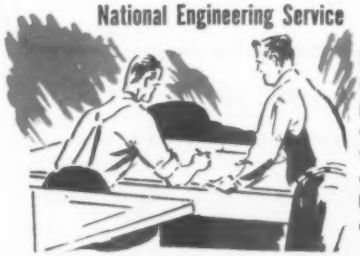
Anti-friction roller-bearings on all but the smallest models reduce wear to a minimum. All working parts are lubricated either by means of high-compression grease fittings or through oil in reservoirs which splashes the operating parts.

Study the many other important construction details shown in the cut-away view on the opposite page . . . details that make the Simpson Mixer better—that insure better sand control wherever it is used. That's why 4 out of every 5 mixers sold today are Simpsons.

THIS is the second of a series of advertisements pointing out reasons why Simpson Mixers will help you achieve better sand control. Advertisements to follow will give detailed descriptions of the various component parts — watch for them.

The new 64 page, generously illustrated Simpson Handbook presents the complete story of better sand control and Simpson Mixers— if you do not have a copy, write for one today. You'll find it a valuable and highly informative book. There is no obligation, of course.

National Engineering Service



For more than 30 years National Engineering and Field Service, has helped hundreds of foundries solve problems in sand preparation, reclamation, handling, storage and control. Today, National Engineers are constantly on the job helping foundries with problems of sand handling and control on construction, maintenance, repair or new requirements. National Engineering and Field Service is available and eager to help you whenever and wherever you need it.

National Field Service

NATIONAL ENGINEERING COMPANY

MACHINERY HALL BUILDING • CHICAGO 6, ILLINOIS

Manufacturers and Selling Agents for Continental European Countries—The George Fischer Steel & Iron Works, Schaffhausen, Switzerland. For the British Possessions, Excluding Canada and Australia—August's Limited, Halifax, England. For Canada—Dominion Engineering Co., Ltd., Montreal, Canada. For Australia and New Zealand—Gibson, Battle & Co., Pty., Ltd. Sydney, Australia

AIRCO GASES

. . . FOR PRODUCTION, MAINTENANCE AND RESEARCH

AIRCO gases, produced by modern scientific methods to the strictest standards of purity and uniformity, are supplied to industry through nation-wide Airco distributing points. These gases are available in volumes to meet every requirement . . . in standard commercial size cylinders and in trailers with capacities up to 40,000 cu. ft. Thus Airco gases are quickly delivered to shops and plants throughout the country in whatever size containers are most suitable for the customers' needs. In that way, individual requirements for 200, 20,000, or several million cubic feet, monthly, are met.

To assist manufacturers in using these Airco gases most effectively, Air Reduction provides "on-the-job" technical assistance through its Applied Engineering Field Service Department. For further information on Airco gases—as well as Airco's complete line of apparatus and supplies for every oxyacetylene flame application and arc welding need—call or write the nearest Airco office, or, if you prefer, communicate direct with the New York Office, Department F.

OXYGEN guaranteed 99.5% pure . . . assures maximum speed and economy in cutting, and greater efficiency in welding.

ACETYLENE proved by use and test to be the most economical fuel gas for oxyacetylene welding and other flame applications.

NITROGEN dry and inert, contains less than 0.3% oxygen. Also available at higher purity to meet specialized needs.

HYDROGEN produced electrolytically, contains less than 0.5% oxygen.

ARGON manufactured pure or mixed with nitrogen as specified by user.

HELIUM is available with a purity of approximately 98% and higher.

★ BUY UNITED STATES WAR BONDS ★

AIRCO WILSON

AIR REDUCTION

General Offices: 60 EAST 42nd STREET, NEW YORK 17, N. Y.

In Texas: MAGNOLIA AIRCO GAS PRODUCTS CO. • General Offices: HOUSTON 1, TEXAS

Offices in all Principal Cities

User Says:

Royer Saves Five Ways

The Royer sand conditioner pictured is in operation at Clio Foundry, Inc., Clio, Michigan, which company is producing gray iron castings for nationally known manufacturers in the eastern Michigan industrial area. The user writes:

"Formerly all our sand was cut by hand. Since getting the Royer we have noticed a vast improvement in the condition of our sand due to the fact that all pieces of iron are eliminated from the sand by the Royer. The moisture condition of the sand is much better. The sand is much fluffier and produces a much better casting finish, and also reduces our scrap. In fact, we are very well pleased with the results. The Royer is also quite a time saver, as it practically cuts in two the time necessary for cutting our sand. Since labor is scarce at this time, it's a double help to us."

Over 6,000 Royers are now in service—in foundries large and small—nonferrous, gray iron, malleable and steel—production and jobbing shops. Made in models and sizes to serve every foundry requirement. All are described and pictured in our new Catalog No. 744. Ask for a copy.

Only the Royer assures this complete six point sand conditioning:

1. Thorough refuse removal
2. Positive lump breaking
3. Complete blending and mixing
4. Even distribution of moisture
5. Increased permeability
6. Double aeration

THE ROYER FOUNDRY & MACHINE CO.
KINGSTON, PENNSYLVANIA

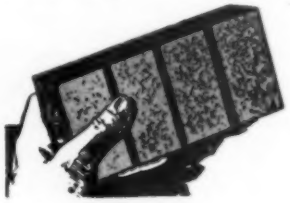
FOREMOST IN SAND CONDITIONING EQUIPMENT

get into the swing

WITH the reconversion from war to peace activities, stimulating the production of castings for domestic products, has come an accelerated swing to Famous CORNELL Cupola Flux.

Factors in this upswing are: thin leg castings for washers and ironers, heating system castings, pistons and cylinders for pleasure craft motors and numerous other types of castings which definitely demand the pure iron that results from the use of Famous CORNELL Cupola Flux.

This is significant but more significant still is the fact that consistent users of this famous flux have come to regard it as a *must* in all melts, feeling that only the best is good enough in all instances in castings.



FAMOUS CORNELL FLUX

Remember a brick of flux means Famous CORNELL Flux—made in Cleveland and popular for over 25 years.

If you are not now a user of Famous CORNELL Cupola Flux this trend should prompt you to give it a thorough trial that you too may have the benefit of its many advantages.

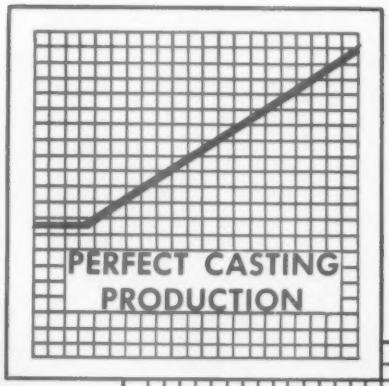
The CLEVELAND FLUX *Co.*

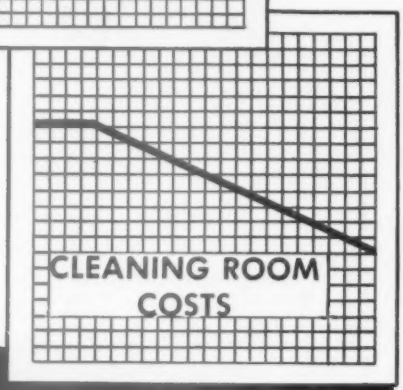
Manufacturers of Iron, Brass and Aluminum Flux Since 1918

1026-36 Main Ave., N. W.
CLEVELAND, OHIO

PROOF

PLASTI-LASTIC





THERMOKOAT

THE NEW DELTA CORE AND MOLD WASH WILL INCREASE PRODUCTION OF PERFECT CASTINGS AND CUT CLEANING ROOM COSTS

DELTA THERMOKOAT Core and Mold Wash is a truly outstanding achievement in the science of core and mold wash development. Its unusually distinctive characteristics have already been acclaimed by a host of prominent foundrymen.

DELTA THERMOKOAT Core and Mold Wash is chemically processed to produce surface elasticity which seals fissures and distortions created by expansion of the sand grains in contact with the heat of molten metals. It is a sealing agent which is active at the temperatures at which metals are poured. On cooling, it solidifies and produces a mechanical peeling action on the surface of the casting.

These are the factors which are of critical importance in the production of smoother, cleaner casting surfaces.

As a secondary protection DELTA THERMOKOAT contains refractory materials having a fusion point of over 4000°F Ask for a liberal working sample together with complete data for use.

NOTE THESE IMPORTANT ADVANTAGES

(1) For All Types of Sand Cast Metals
(2) Moisture Proof
(3) No Precipitation
(4) Highly Refractory
(5) No Gas
(6) Adheres to Sand Surfaces
(7) Easy to Apply
(8) Produces Smooth Casting Surfaces

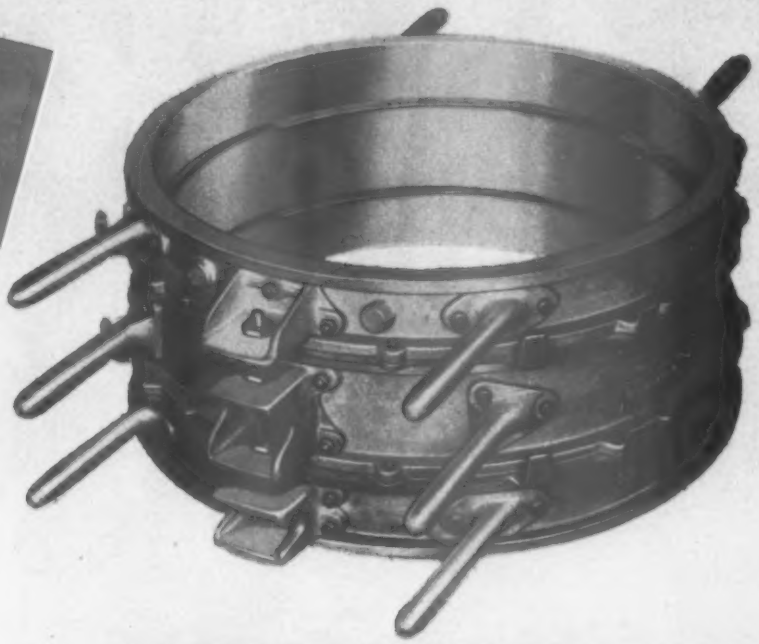
DELTA OIL PRODUCTS CO.

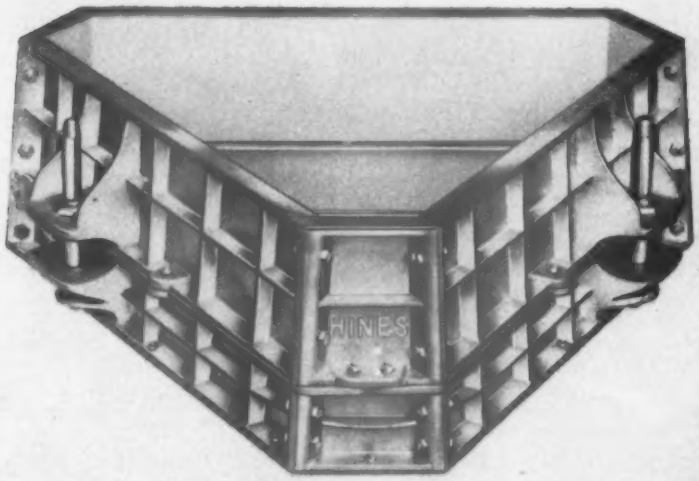
MANUFACTURERS OF INDUSTRIAL & AUTOMOTIVE OILS, GREASES AND COMPOUNDS

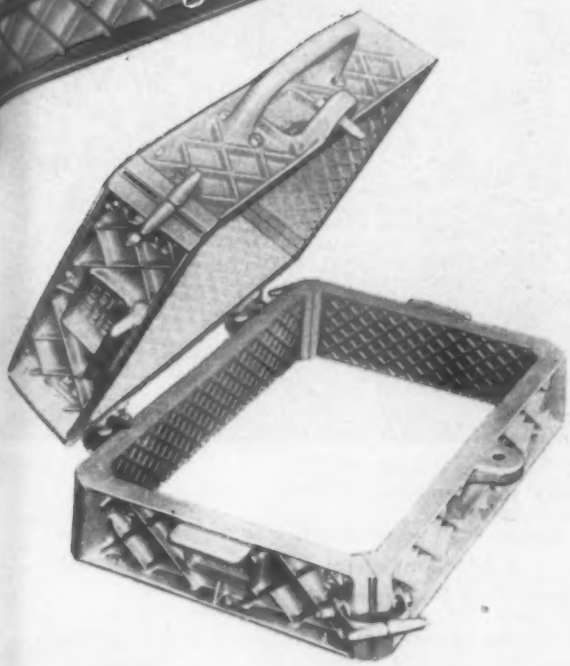
MILWAUKEE 9, WISCONSIN

THE HINES
1324 HIRD AVENUE

BUILT BY *Hines*





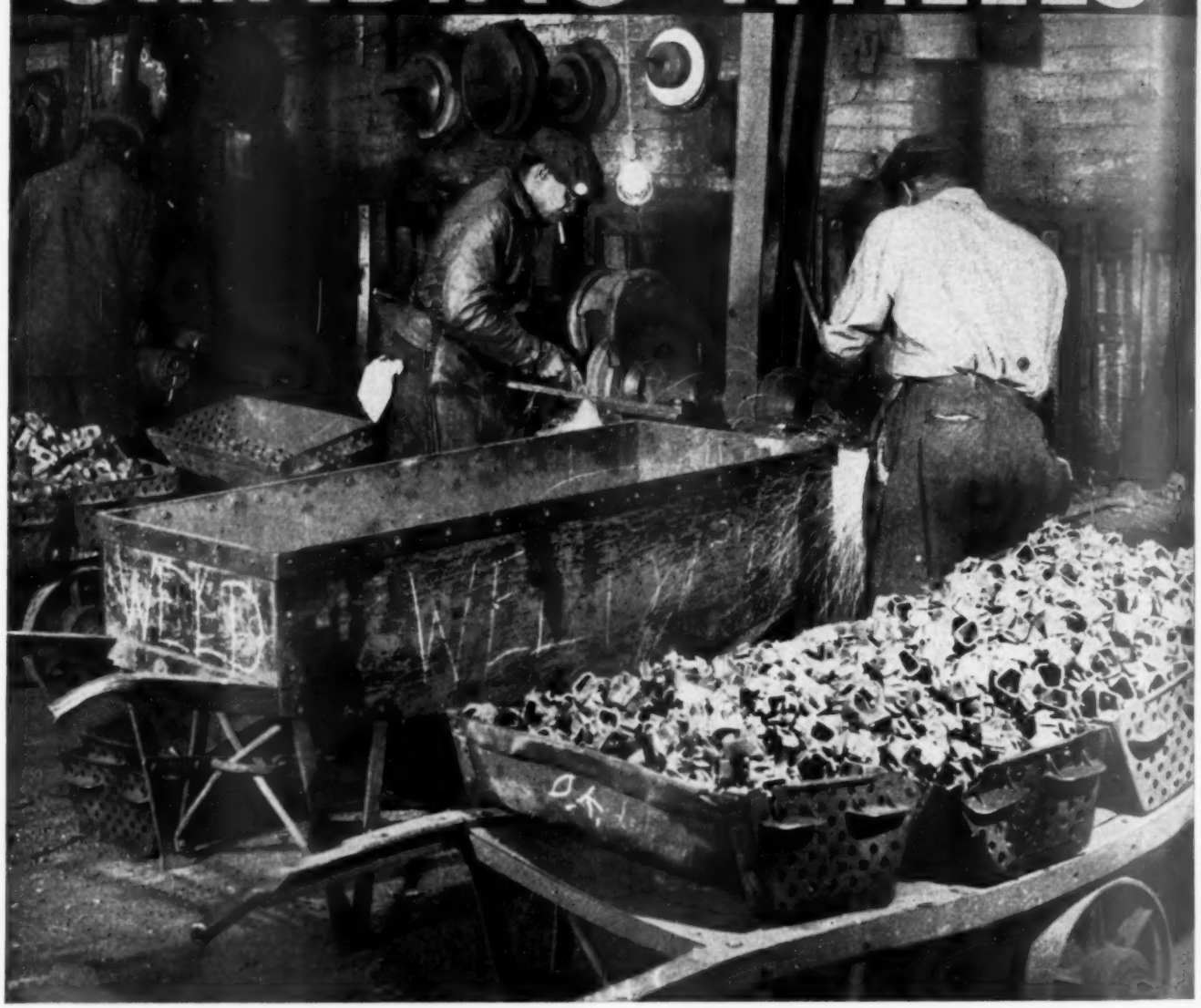


● The flasks shown on these pages were each designed to do a special job more efficiently and, in some cases, the making of castings thought impractical if not impossible. It's not too early to consider your postwar casting problems—competition will be keener. A Hines flask, custom-built, perhaps including the patented "Pop-Off" feature may make it possible for you to cast that "tough" job economically. Consult with the exclusive builders of flasks and jackets for over twenty-five years.

FLASK CO.

CLEVELAND 7, OHIO

MACKLIN
GRINDING WHEELS



FOUNDRIES, large and small, require grinding wheels in many sizes, shapes, grains and grade combinations.

Macklin Company is thoroughly equipped to produce high quality grinding wheels for all foundry requirements.

No matter what your grinding problems may be there is a Macklin wheel to fit the job that will "Protect Your Production."

Ask for the services of a Macklin Field Engineer.

Invest in War Bonds

MACKLIN COMPANY

Manufacturers of GRINDING WHEELS—JACKSON, MICHIGAN, U. S. A.

Distributors in all principal cities

Sales Offices:—Chicago - New York - Detroit - Pittsburgh - Cleveland - Cincinnati - Milwaukee - Philadelphia

PARASPRAY

For Aluminum Casting

Many of America's largest Aluminum foundries find the use of Paraspray invaluable . . .

BECAUSE

Paraspray, by eliminating porosity, cuts scrap losses "spectacularly" and improves quality . . .

THROUGH

its action as a fluxing agent in breaking up oxide inclusions in any part of a mold where they occur.

THEREFORE

you should know about it. Write today for your test sample of Paraspray—fill in your name below. You will receive it together with instructions without obligation, express prepaid and no charge.

DON'T OVERLOOK OUR PARACOAT AND PARASOLV

PARASPRAY (CORES AND MOLDS)

PARASET (COPE AND DRAG)

PARACOAT (FOR PATTERNS)

COPY'T. 1943-FRCC

FOUNDRY RUBBER COMPOUNDS CORP.

1050 - 30TH ST., N.W. WASHINGTON 7, D.C. REPUBLIC 2256

Mail Coupon Today

Sole licensees under the Saeger Patents exclusively regulating the use of rubber compounds in making and spraying cores and molds.

TEST SAMPLE FREE—CHARGES PREPAID

Foundry Rubber Compounds Corp.
1050 - 30th Street, N. W.
Washington 7, D. C.

Without obligation, send me PARASPRAY sample prepaid, with instructions.

Individual Name.....

Position.....

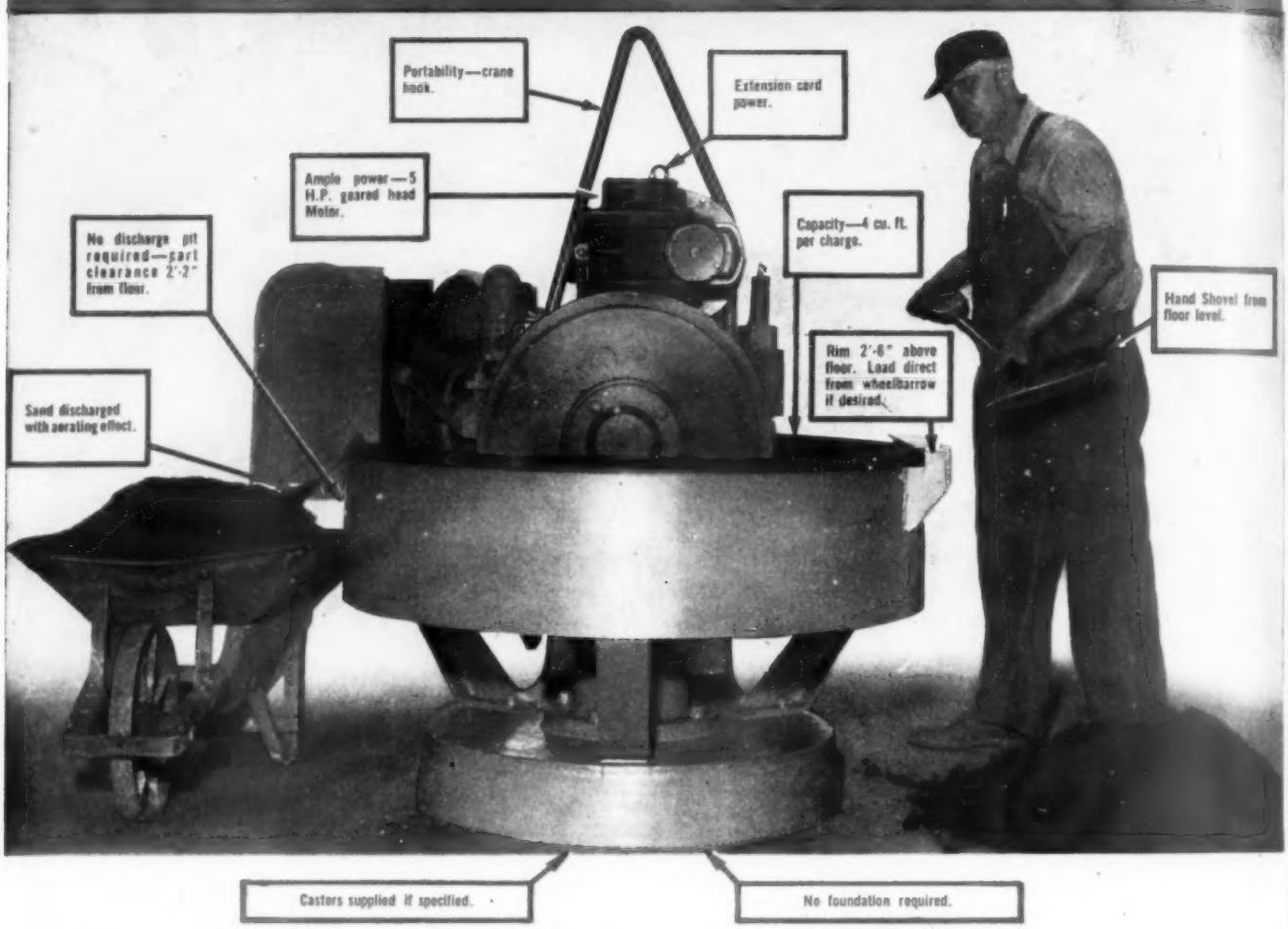
Company Name.....

Shipping Address.....

.....

The CLEARFIELD 404 MIXER

SELF-CONTAINED WITH BASE AND DRIVE


Portability—crane hook.
Extension cord power.
Ample power—5 H.P. geared head Motor.
No discharge pit required—part clearance 2'-2" from floor.
Capacity—4 cu. ft. per charge.
Hand Shovel from floor level.
Rim 2'-6" above floor. Load direct from wheelbarrow if desired.
Sand discharged with aerating effect.
Castors supplied if specified.
No foundation required.

NO PITS OR PIERS . . . MAY BE OPERATED FROM CRANE OR MONORAIL IF DESIRED . . . LOAD MANUALLY OR BY MECHANICAL CHARGING UNIT AS PREFERRED

There's a place for everything: watch charms on watches; toys on Christmas trees. Neither belongs in the foundry.

The Clearfield 404 is a seriously engineered and sturdily built machine. While compact and portable, these features are subordinated to its primary purpose of thorough, efficient sand conditioning. Here is a mixer that asks no coddling. It can take it—and dish it out.

As hundreds of users attest, the Clearfield 404 is first and foremost a rugged production machine—with flexibility and convenience in operation an extra dividend.

TIMKEN BEARING EQUIPPED

P. S. IF YOU NEED SOMETHING BIGGER, WE HAVE THAT TOO. WRITE FOR CATALOG.

CLEARFIELD MACHINE COMPANY

CLEARFIELD
PENNSYLVANIA, U. S. A.

purchases MONARCH of Baltimore, Maryland

FISHER FURNACE CO. BUYS ALL RIGHTS OF MONARCH ENG. & MFG. CO.

The industrial furnace business of the Monarch Engineering and Manufacturing Company of Baltimore, Maryland, has been purchased by the Fisher Furnace Company of Chicago. The transaction gives the Fisher Furnace Co. all rights to manufacture Monarch Equipment and includes all patterns, drawings and parts inventories.

Future plans provide for the continued manufacture of certain specialized Monarch Furnaces with improved design features, and the continuation of a complete parts service for Monarch Furnaces now in operation. All Monarch Furnaces to be carried over into the Fisher Line will be subjected to a thorough revamp and modernization program by the Fisher Engineering Department at Chicago. Combined headquarters and manufacturing facilities will be located in the two existing Fisher plants in Chicago for the present.

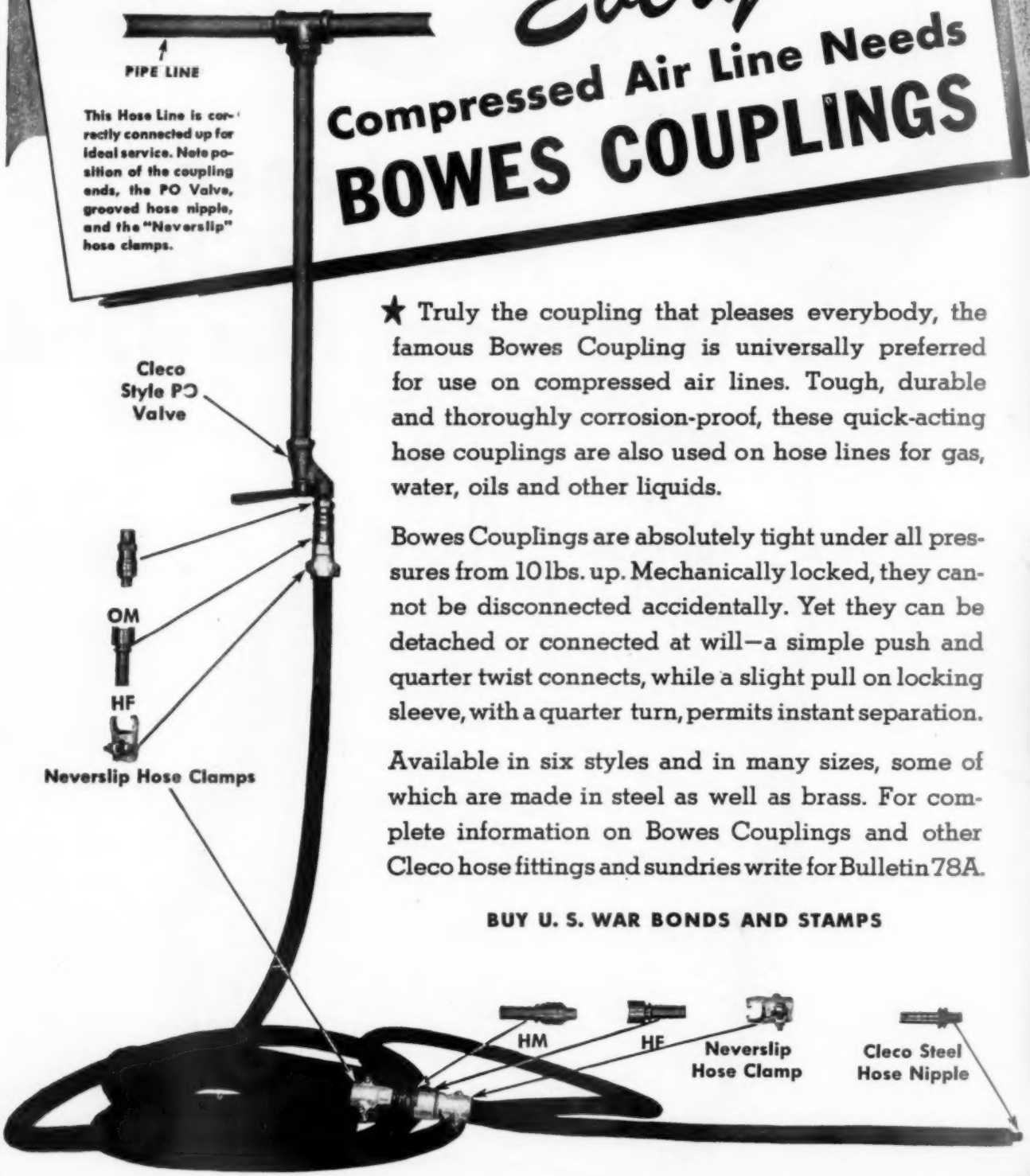
The Fisher Furnace Company has engineered and manufactured a broad line of melting furnaces, blowers, refractories and allied equipment since 1906 and has, in recent years, pioneered much of the progress in melting non-ferrous metals through its engineering and plant layout research.

5519 N. WOLCOTT AVENUE, CHICAGO 40, ILLINOIS

Fisher FURNACE COMPANY

Engineers and Manufacturers

Every Compressed Air Line Needs BOWES COUPLINGS


PIPE LINE
This Hose Line is correctly connected up for ideal service. Note position of the coupling ends, the PO Valve, grooved hose nipple, and the "Neverslip" hose clamps.
Cleco Style PO Valve
OM
HF
Neverslip Hose Clamps
HM
HF
Neverslip Hose Clamp
Cleco Steel Hose Nipple

★ Truly the coupling that pleases everybody, the famous Bowes Coupling is universally preferred for use on compressed air lines. Tough, durable and thoroughly corrosion-proof, these quick-acting hose couplings are also used on hose lines for gas, water, oils and other liquids.

Bowes Couplings are absolutely tight under all pressures from 10 lbs. up. Mechanically locked, they cannot be disconnected accidentally. Yet they can be detached or connected at will—a simple push and quarter twist connects, while a slight pull on locking sleeve, with a quarter turn, permits instant separation.

Available in six styles and in many sizes, some of which are made in steel as well as brass. For complete information on Bowes Couplings and other Cleco hose fittings and sundries write for Bulletin 78A.

BUY U. S. WAR BONDS AND STAMPS

THE CLEVELAND PNEUMATIC TOOL CO.

3781 EAST 77th ST. *Branch Offices in All Principal Cities* CLEVELAND, OHIO

★

In Jobbing Foundries it is estimated that 95% of the flasks vary in length

★Davenport

MODERN ROLLOVER MOLDING MACHINES

all have

OPEN ENDS

with versatility of flask length range

Davenport Rollover No. 34—SA
Handling a 42" x 64" x 14" flask

Davenport Rollover No. 34—A
Handling a 30" x 68" x 10" flask

Davenport Molding Machines offer you many additional, outstanding features, such as—

- Easy installation
- Central control
- Air operated flask clamps
- Hydraulic check cylinder
- Automatic flask leveler
- Valveless jolt
- Electric jolt timing
- Adjustable draw

all of which have made Davenport Molding Machines standard equipment in hundreds of American foundries.

Davenport Rollover No. 34—SA
Handling a 28" x 56" x 14" flask

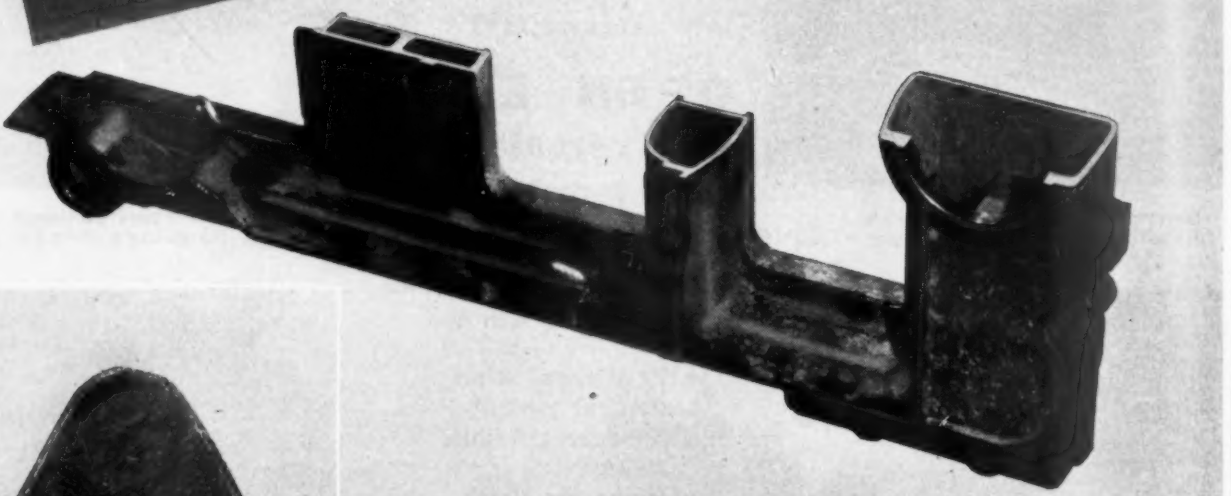
Davenport Rollover No. 40—A
Handling a 36" x 64" x 24" flask

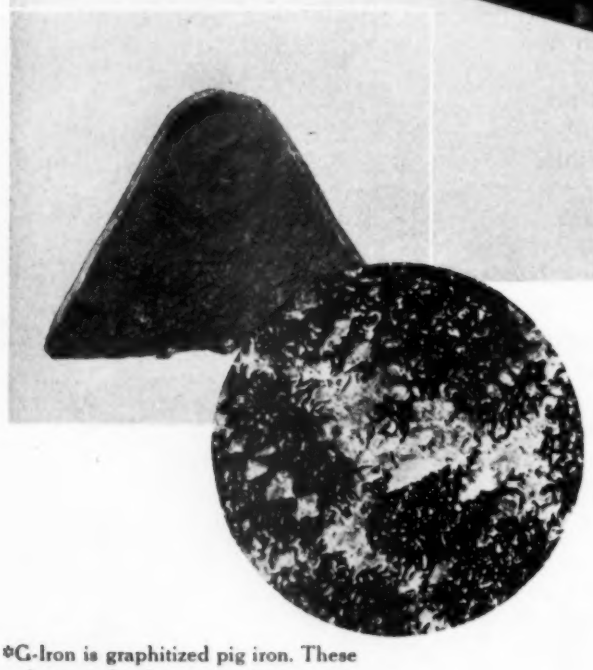
DAVENPORT
MACHINE & FOUNDRY CO.
Davenport, Iowa • U. S. A.

DAVENPORT

SEND FOR OUR COMPLETE CATALOG

G-IRON* helps solve the problem of casting thick and thin sections





Greater fluidity of G-Iron and reduction in internal shrinkage help solve the problem of casting thick and thin sections without the danger of cold shuts and shrink pockets. Reduces scrap losses.

*G-Iron is graphitized pig iron. These photographs show its grain structure. *Circle:* Photomicrograph etched—100 diam. Manufactured under U. S. and Canadian patents.

TONAWANDA IRON CORPORATION

NORTH TONAWANDA, N. Y.

Division of AMERICAN RADIATOR & Standard Sanitary CORPORATION

Now Available

TO EVERY FOUNDRY

MINCO BOND

MAINTAINS and INCREASES PERMEABILITY

MINCO BOND is the last word, the most recent advance in an ever changing, ever improving American foundry practice.

MINCO BOND brings to the floor shops and jobbing foundries of America what the introduction of synthetic sand did for the p oduction foundries a quarter century ago. It gives them control of their sand.

Can be mixed into heaps with hand labor. Will not lump up. Your *"burned out"* sand is your *best sand. Rebond* it with *MINCO BOND.* Eliminates casting blows. Reduces cleaning and shake out costs sometimes 50% with much smoother castings.

When MINCO BOND is used as part of the sand formula in production foundry systems, it increases flowability, eradicates all lumps and hard baked sand from the shake out. It usually reduces the shake out and cleaning costs in production foundries 50%—with much smoother castings. Eliminates casting blows.

For Grey Iron, Malleable, Steel and Non-Ferrous Foundries.

Over 30 non-ferrous foundries in the Cleveland area have been grateful users of Minco Bond in their work the past three years.

We wish to pause in our efforts to thank our distributors for their good job in proving Minco Bond to the American Foundry Industry over the past four years.

We also wish to voice our appreciation and thanks for their substantial and moral help following our disastrous fire of March 13th.

We are now installed in our new plant with production more than doubled and with the friendly competent help of our distributors we will be serving you for many many years.

MINCO PRODUCTS CORPORATION

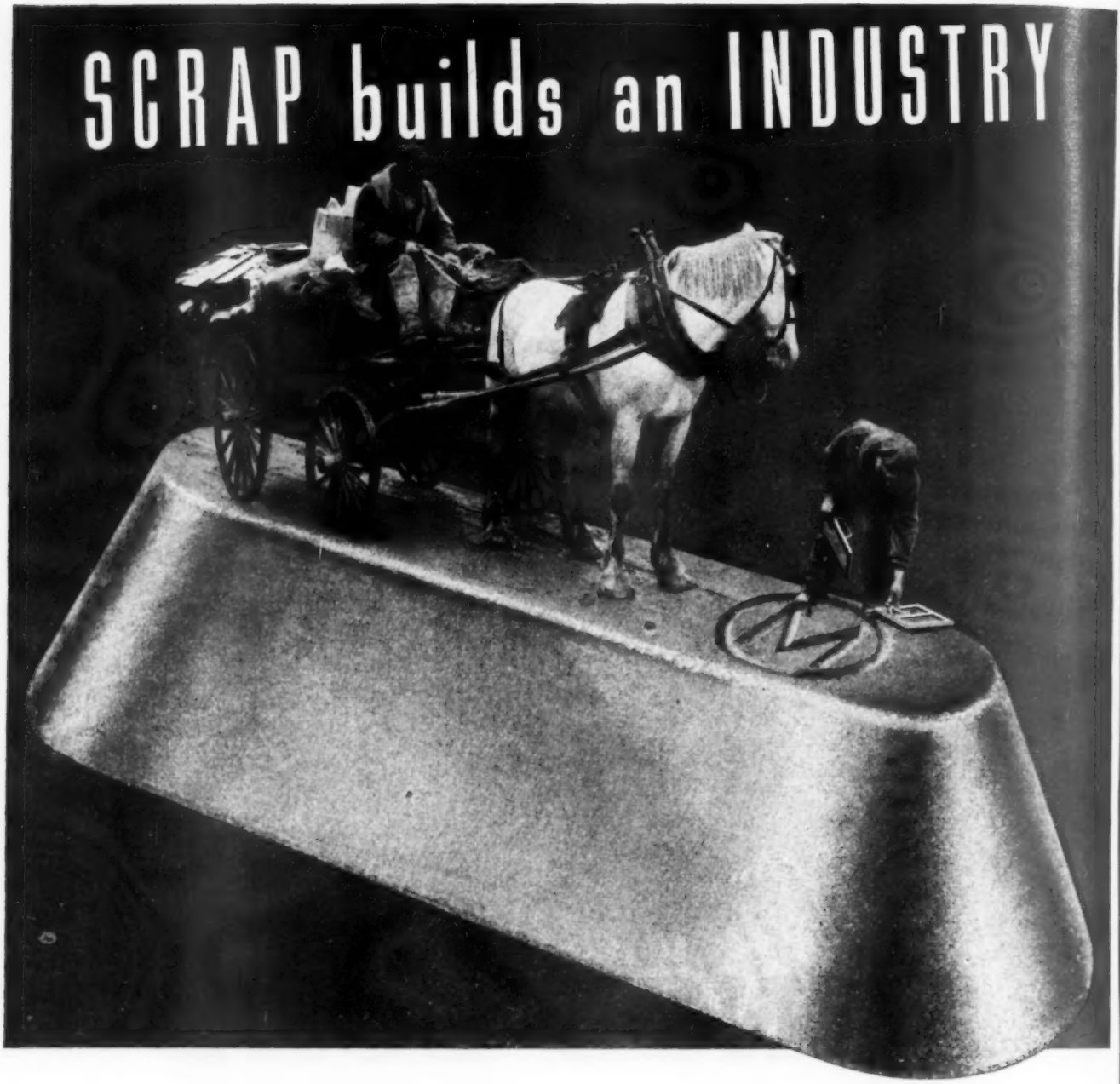
SAGINAW, MICHIGAN

WARNER R. THOMPSON CO.
323 Hamilton Ave., Detroit, Mich.

HOFFMAN FOUNDRY SUPPLY CO.
1193 Main, Cleveland, Ohio

THE BUCKEYE PRODUCTS CO.
7020-34 Vine Street, Cincinnati, Ohio

SCRAP builds an INDUSTRY



RIGID selection and segregation of the many varieties of non-ferrous scrap that come into the plants of Michigan Smelting, is the first step in a process that results in the making of accurate analysis, non-ferrous alloy ingot.

If you are a user of non-ferrous alloys, the 50 years experience of this organization, should be of interest to you as a guarantee of the quality of the product we supply. New and informative booklet—sent on request.

BUY
WAR
BONDS

REFINERS OF NON-FERROUS
SCRAP METALS FOR OVER 50 YEARS

MICHIGAN SMELTING & REFINING

Division of

BOHN ALUMINUM & BRASS CORPORATION • Detroit 26, Michigan

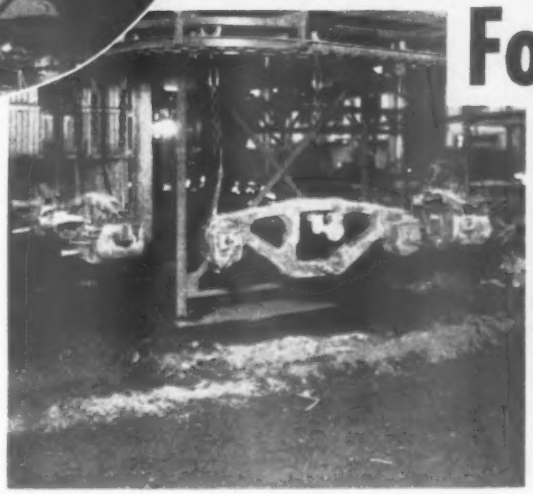
General Offices Lafayette Building

Despite enormously improved conditions effected during the past two decades, founding remains a real man's job and, curiously enough, you can't drive a good foundryman away from his job. He loves the noise and smoke and fume and dust.

HYDRO-BLAST ----

a cushion against Foundry Labor Shortage!

Today, the government and the foundry find themselves in acute need of sufficient manpower to make essential castings for war work. This is particularly true in the core knockout and cleaning rooms of foundries where almost all the unsatisfactory conditions of operation find their highest exemplification. Running a chipping hammer against a casting on a hot day is not an appealing function. There is absolutely no attraction for the glamour boys.



Lack of adequate labor poses a problem for both government and operators, primarily because it is a "he man's" job and the "softy" sees no glamour in noise and smoke and sweat and molten metal and arduous physical exertion.

Hydro-Blast claims no panacea for the foundry's age-old problems. It can make savings whose annual cumulative value are usually in excess of the investment made in this modern mechanism.

With Hydro-Blast, two operators can do the work of ten core knockout men, releasing 8 of your present cleaning room laborers for metal chipping. Savings in transport ton miles are another war-worthy item that appears in balance sheet black. Casting handling and sand handling economies are apparent wherever Hydro-Blast has been installed.

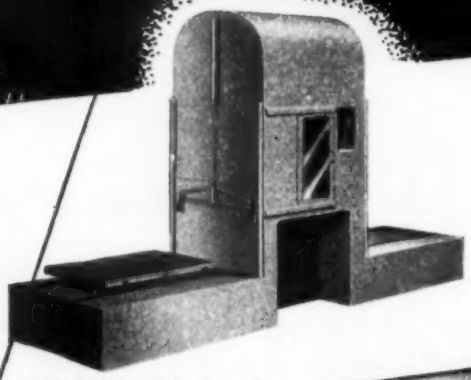
In fact, these Hydro-Blast economies, while of less importance than all-out war production of castings, are an absolute necessity when combined with Hydro-Blast's ability to improve working conditions in the least attractive department of the foundry.

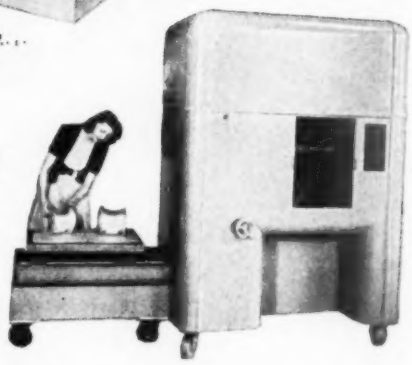
THE HYDRO-BLAST CORPORATION

2550 N. WESTERN AVENUE
CHICAGO 47, ILLINOIS

KELEKET X-RAY CAN IMPROVE YOUR PRODUCT

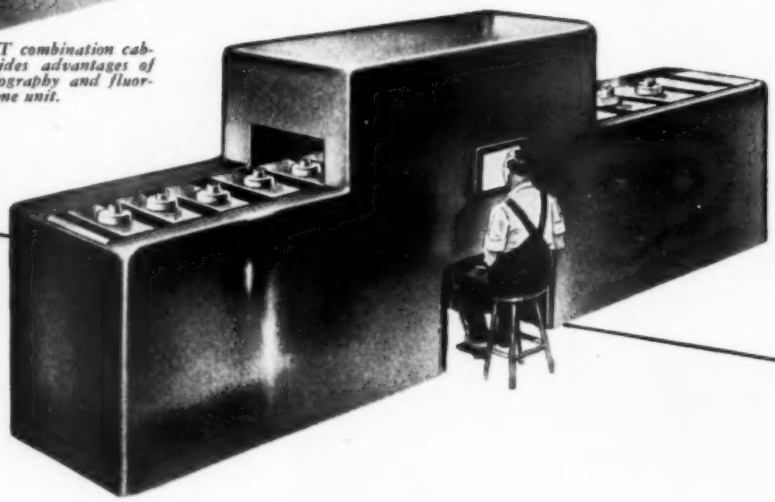
KELEKET *radiographic cabinet used for inspecting critical airplane parts.*





KELEKET's *mobile inspection cabinet operates fluoroscopically or radiographically.*

KELEKET *combination cabinet provides advantages of both radiography and fluoroscopy in one unit.*



KELEKET's *conveyor belt fluoroscopic cabinet for high-speed, continuous inspection, may also be used radiographically.*

There is no question about X-ray's performance in industry today—nor the job it can do on the product you make.

Castings? Welds? Complete assemblies? Only X-ray inspection can detect every defect speedily, inexpensively, non-destructively, and before costly machining operations are performed. Marvel of industrial efficiency, no modern plant will do without it.

KELEKET—the quality name in X-ray—knows industrial inspection through and through. KELEKET knows above all that X-ray equipment must fit your plant. That's why KELEKET incorporates X-ray into cabinets—fluoroscopic, radiographic, or a combination of both—if that's what your production set-up requires. That's why KELEKET cabinets are stationary or mobile—or even conveyor units that become an integral part of a moving assembly line.

Hundreds of KELEKET installations in plants all over the country are improving products, cutting costs, and preventing failures in use. Tell us your problem, show us your plant, and we'll demonstrate how X-ray can serve you best.

KELEKET representatives are located in 64 cities in the U. S. and Canada—consult the one nearest you or write direct to Covington for complete information.

KELLEY-KOETT X-RAY MFG. COMPANY

2279 WEST FOURTH ST., COVINGTON, KY.

PIONEER CREATORS OF QUALITY X-RAY EQUIPMENT SINCE 1900

How good a job are you making of your motor applications? Is each job really "a sweetheart" or do they look more like the results of a shotgun wedding?

It's easier to make each job a sweetheart . . . if you take advantage of the wide flexibility of Master motor drives. For instance, look at the application shown below. By incorporating a motor, an electric brake, a mechanical variable speed unit and a gear reduction . . . all designed and built into one compact integral unit . . . this Master motor provides variable speed at exactly the right range and in addition can be quickly and accurately stopped at exactly the point desired. It mounts neatly on the machine, saves space, saves money and greatly improves the output, safety, appearance and convenience of the equipment.

Probably you will not need exactly the same combination of motor features illustrated below, but the Master line includes motors for every current specification, every type of enclosure, and every type of mounting arrangement . . . in fact, is the most flexible, the most versatile line of motor drives in the world.

Investigate Master's unusual ability to serve you economically with motors that really fit the job in sizes from 1/10 to 100 HP.

THE MASTER ELECTRIC COMPANY • DAYTON 1, OHIO

MOLDING MACHINES

FOR PEAK PRODUCTION

FASTEST MOLDING . . . LOWEST MAINTENANCE

16-36 Type D Heavy Duty Jolt Squeeze Molding Machine with Pattern Drawing Device—Open End Frame—7" diameter jolt piston—16" diameter squeeze piston.

Redesigned to a minimum of working parts, thereby greatly reducing maintenance cost and at the same time lowering operating costs through saving of labor.

TODAY—More than ever—foundrymen must rely upon their molding equipment to meet production schedules. They cannot afford to have a breakdown! These machines have played an important role in the success of many large foundries all over the world. This international acceptance is due to their ability to "stand up" under the heaviest production.

Our Type D Molding Machines are built in nine sizes.

We invite you to write for particulars on the NICHOLLS 1944 model production line of Molding Machines.

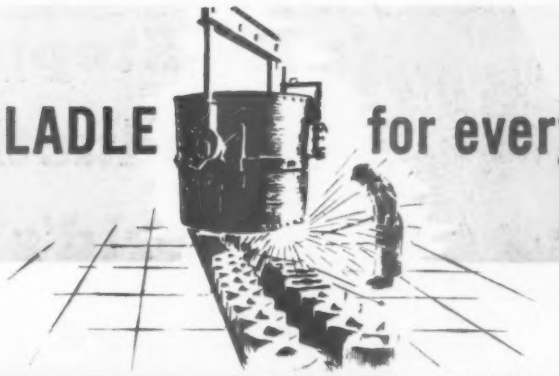
Wm. H. NICHOLLS Co., Inc.
RICHMOND HILL, LONG ISLAND, NEW YORK

Established 1910

Foreign Manufacturers and Selling Agents—
For Continental Europe and Great Britain—The George Fischer Steel and Iron Works, Schaffhausen, Switzerland

NICHOLLS

a WHITING LADLE for every foundry need



Whiting Cylindrical Mixing Ladle with teapot spout.

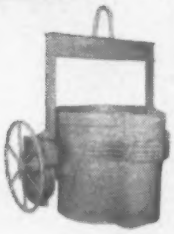
Whiting Ladles are made not only to meet every need for style and size, they are made to furnish complete safety... trouble-free operation... long life... over-all economy.

For sixty years, Whiting has furnished foundrymen with better ladles, guaranteed to give satisfaction and unsurpassed economy in cost per ton of metal poured. For complete details, ask for illustrated Catalog No. 229.

WHITING CORPORATION
15607 Lathrop Ave. Harvey, Ill.

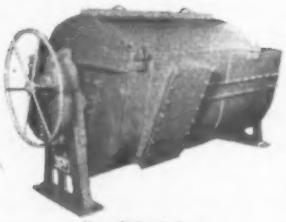
Geared Crane Ladle

Special Bottom-Tap Ladle

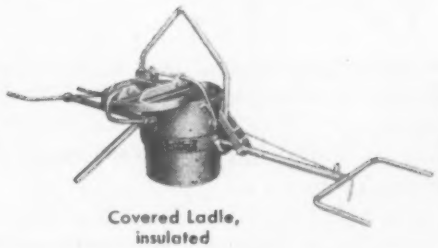


Geared Teapot-Spout Ladle

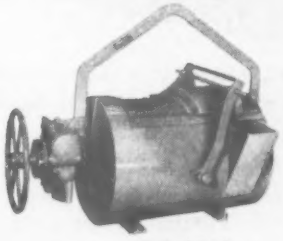
Standard Crane Truck Ladle



Desulphurizing U-Ladle, geared



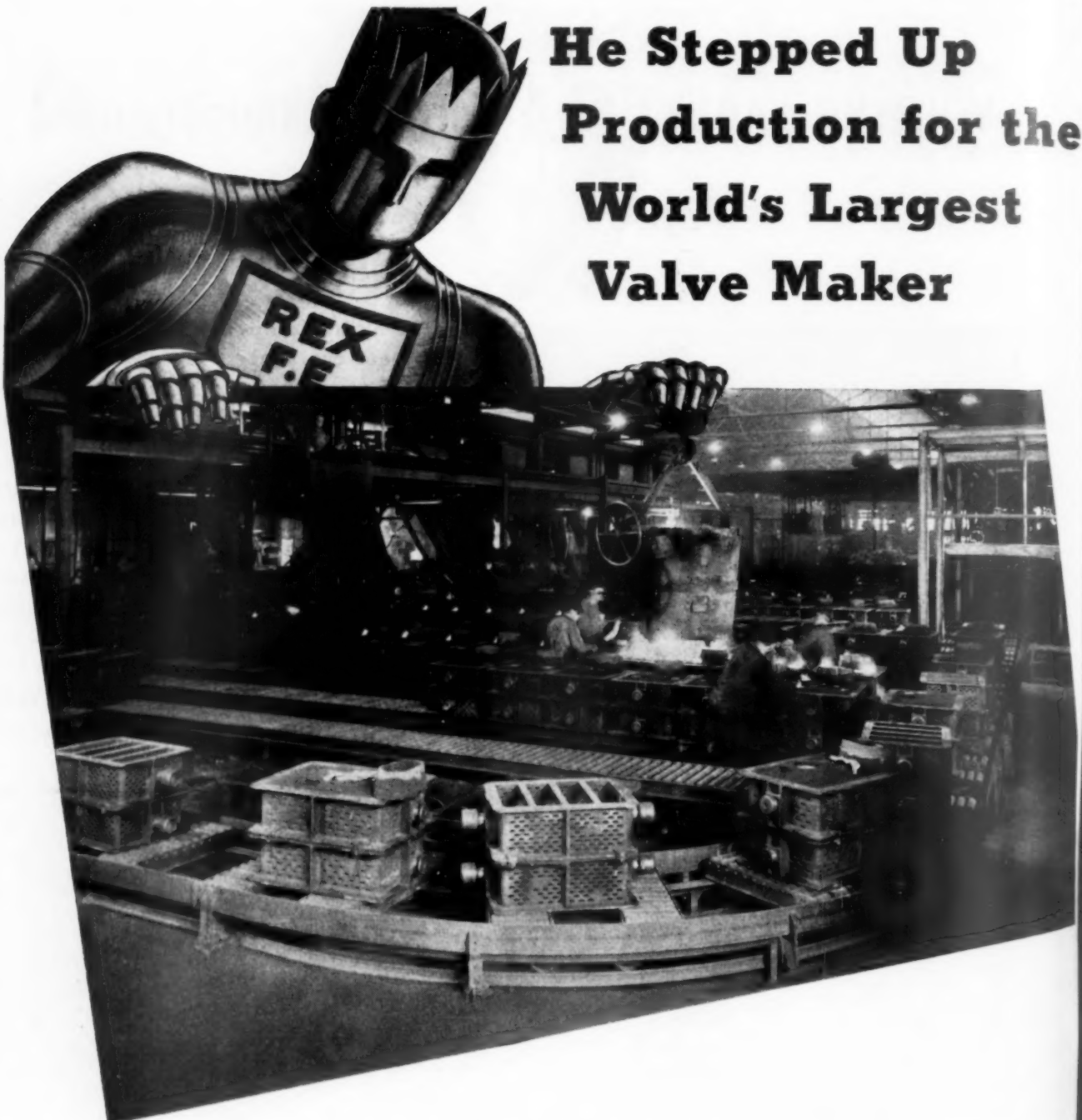
Covered Ladle, insulated



Cylindrical Distributing Ladle

Offices in Chicago, Cincinnati, Detroit, Los Angeles, New York, Philadelphia, Pittsburgh, St. Louis, and Washington, D. C. Agents in other principal cities. Canadian Subsidiary: Whiting Corporation (Canada) Ltd., Toronto, Ontario.

WHITING LADLES CONVERTERS • FURNACES
CUPOLAS • CHARGING EQUIPMENT



He Stepped Up Production for the World's Largest Valve Maker

VALVES ARE VITAL to a nation at war, and to keep pace with the stepped-up wartime demand, valve production had to be greatly increased.

Called in to help increase the capacity of the world's largest maker of valves, Rex Foundry Engineering . . . Rex F. E. . . . knew that the best way to accomplish this would be to modernize the handling system. For, through his many years of experience in solving foundry problems, Rex F. E. knew that no other single factor is more directly responsible for operating efficiency than the right method of handling sand, molds and castings.

He and his staff of experienced foundry engineers designed a new, completely modern handling system. From the time the molding sand starts its journey to the foundry floor until the hot castings are shaken out, every operation is handled on an efficient Rex conveyor system that has greatly increased production capacity and at the same time released thousands of man-hours for other vital production.

* * *

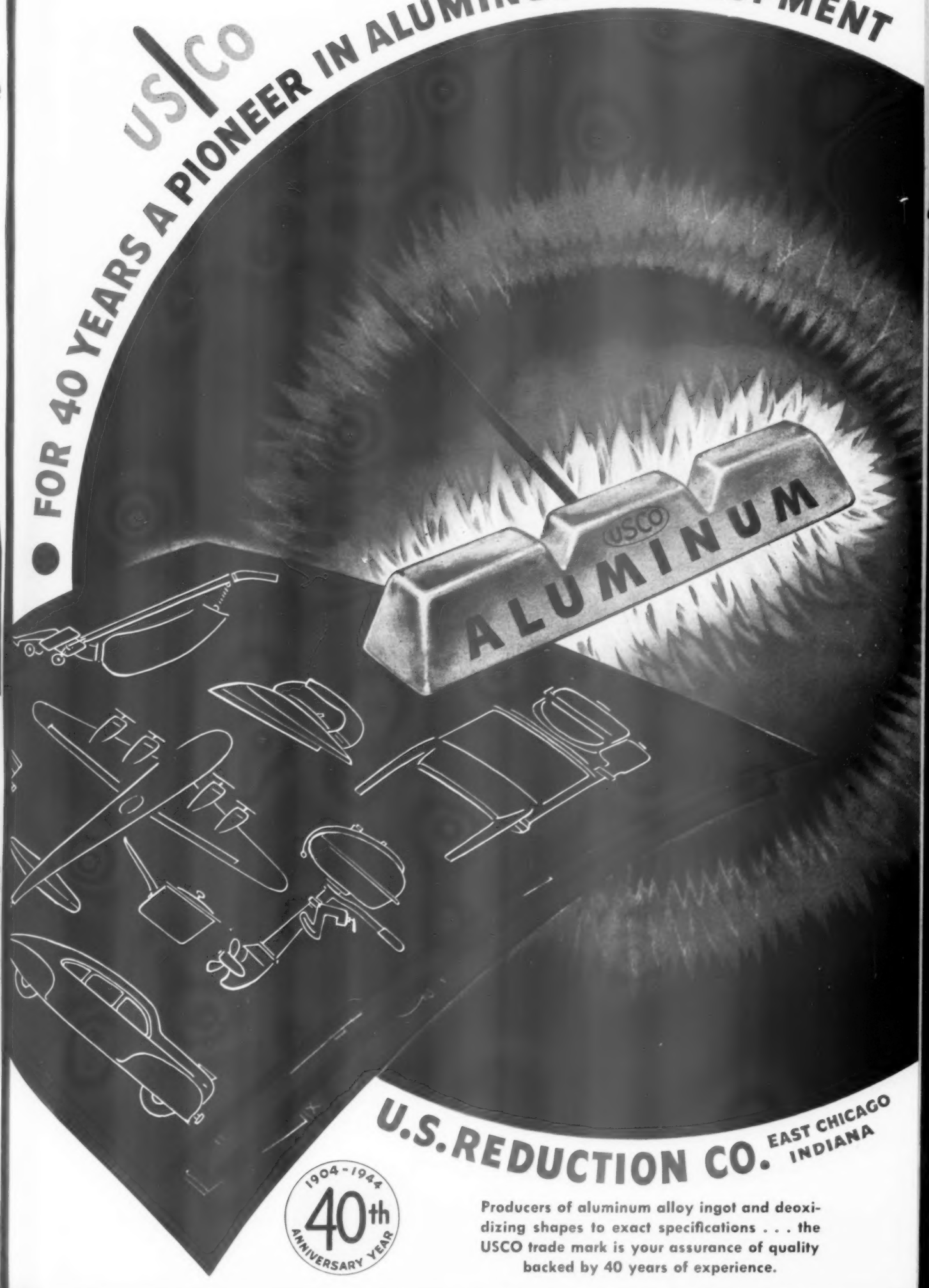
Rex F. E. and his staff of foundry trained engineers are always at your service . . . to help you design and install the best system for your foundry. For complete information, write Chain Belt Company, 1671 West Bruce Street, Milwaukee 4, Wisconsin.

REX **FOUNDRY HANDLING SYSTEMS**

CHAIN BELT COMPANY OF MILWAUKEE

USCO

FOR 40 YEARS A PIONEER IN ALUMINUM DEVELOPMENT



U.S. REDUCTION CO. EAST CHICAGO INDIANA

1904 - 1944
40th
ANNIVERSARY YEAR

Producers of aluminum alloy ingot and deoxidizing shapes to exact specifications . . . the USCO trade mark is your assurance of quality backed by 40 years of experience.

Low Speed Polisher No. 1505-2

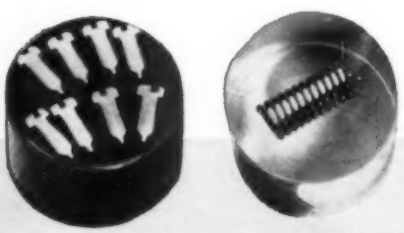
. . for accurate final polishing

THE BUEHLER line of specimen preparation equipment includes —

CUT-OFF MACHINES • SPECIMEN MOUNT PRESSES • POWER GRINDERS • EMERY PAPER GRINDERS • HAND GRINDERS • BELT SURFACERS • POLISHERS • POLISHING CLOTHS AND ABRASIVES

Low speed polishing is increasingly popular for the final step, particularly where soft non-ferrous metals are encountered. The production of smooth polished samples with a minimum of surface scratches and disturbed metal is the outstanding feature of this low speed Buehler Polisher No. 1505-2. Built to operate at selective speeds of 150 r.p.m. and 250 r.p.m. through a positive gear head drive housed in an oiltight base, this polisher represents the highest development in equipment for precision finishing of specimens. This polisher is also perfectly suited to the wax lap or lead lap polishing technique preferred by many metallurgists.

The 8" diameter polishing disc is attached to a countershaft by a tapered sleeve. This tapered fit and long span between bearings assures smooth operation. The motor is ¼ h.p. single phase ball bearing, operating on 110 V., 60 Cycle AC current. Shipping weight, 80 lbs.



Buehler Ltd.

A PARTNERSHIP

METALLURGICAL APPARATUS

165 West Wacker Drive, Chicago 1, Illinois

A "SHAKE-OUT" for the Axis

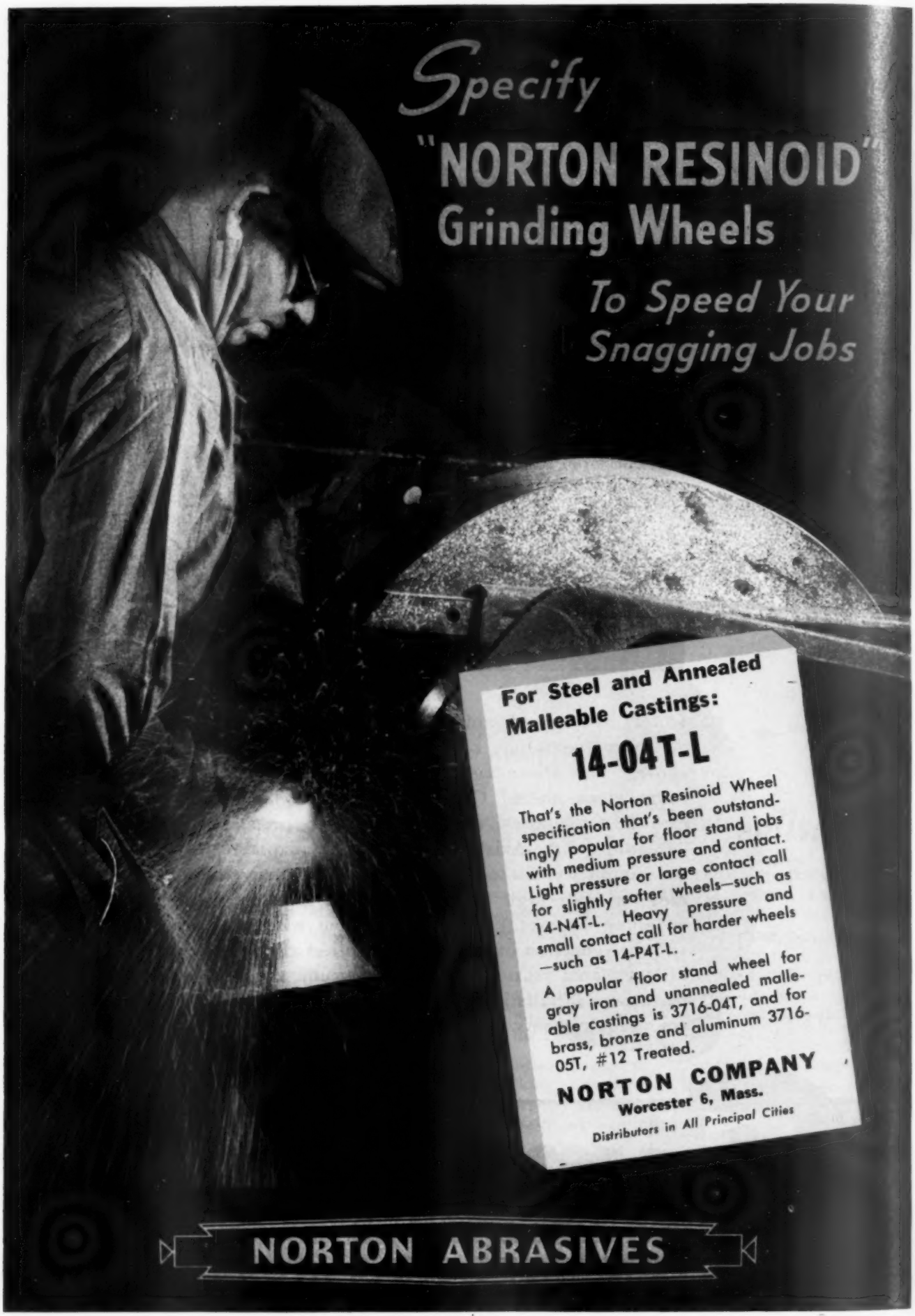
36,000 castings (demolition bombs and hand grenades) are shaken out every four hours on the 3'x8' Light Type Shake-Out illustrated above. This shake-out separates all the sand from the castings and rough cleans them. Over 1200 Simplicity Shake-Outs, operating in over 550 foundries, are taking part in preparing equally effective "greetings-to-the-Axis". Being readily adaptable to any type work, the Simplicity Shake-Outs are handling many different operations, ranging from high speed production lines up to individual loads weighing 95 tons. Speediest shake-out with maximum flask savings and the reduction of manpower required amortize the equipment cost in less than a year. Every Simplicity unit can be used portably until permanent installation is desirable. Have a Simplicity Engineer check your requirements.

Simplicity

TRADE MARK REGISTERED

ENGINEERING COMPANY

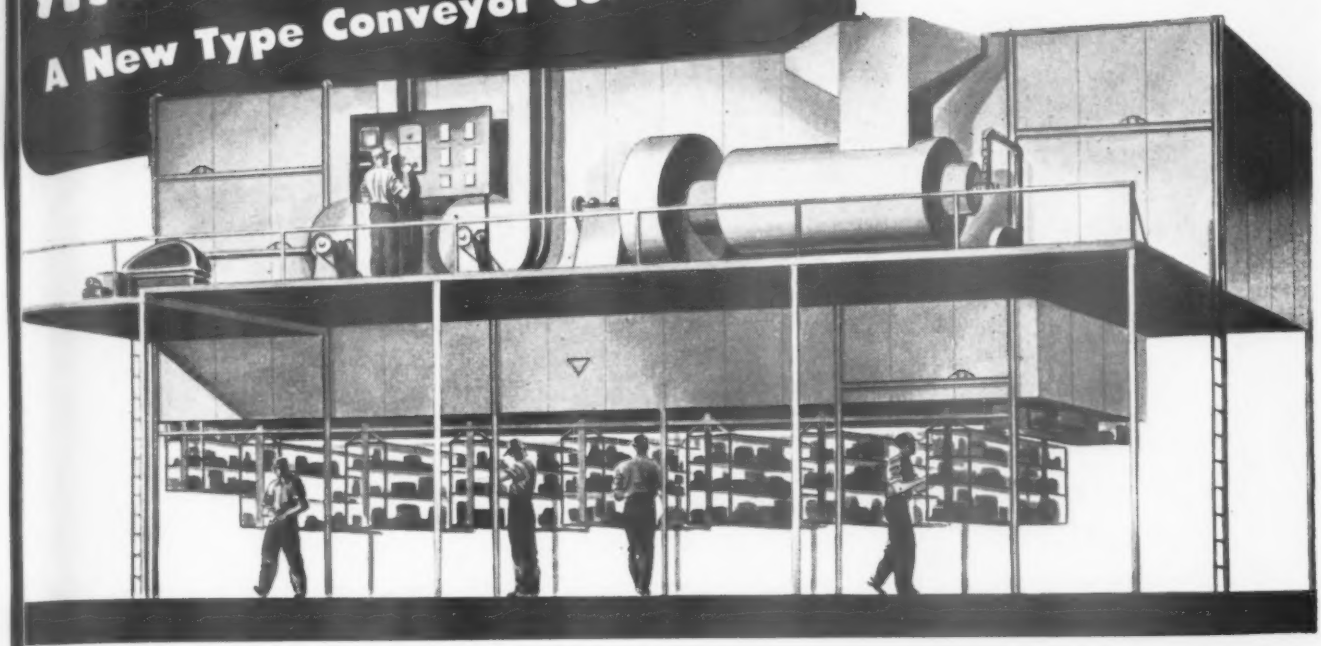
DURAND, MICHIGAN


Specify
"NORTON RESINOID"
Grinding Wheels
To Speed Your
Snagging Jobs
For Steel and Annealed
Malleable Castings:
14-04T-L
That's the Norton Resinoid Wheel specification that's been outstandingly popular for floor stand jobs with medium pressure and contact. Light pressure or large contact call for slightly softer wheels—such as 14-N4T-L. Heavy pressure and small contact call for harder wheels —such as 14-P4T-L.
A popular floor stand wheel for gray iron and unannealed malleable castings is 3716-04T, and for brass, bronze and aluminum 3716-05T, #12 Treated.
NORTON COMPANY
Worcester 6, Mass.
Distributors in All Principal Cities
NORTON ABRASIVES

W-976

ANNOUNCING...

A New Type Conveyor Core Oven!



A Typical Product of Despatch Engineering

This new type of conveyor oven, with a novel arrangement for handling, baking and cooling cores, is the Despatch answer to a mid-western firm's need for increased core baking production. And it's a typical result of Despatch engineering service.

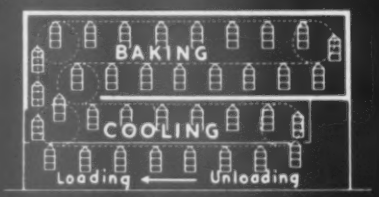
This plant needed high baking output with *best* use of floor-space and labor. Yet they didn't want a vertical oven because it would not fit their building requirements.

Despatch engineers' answer was the compact multi-pass conveyor oven shown above. Carrying 38 core racks, this oven handles, bakes and cools 7000 lbs. of cores per hour, yet over-all oven body dimensions are only 13 ft. wide by 27 ft. high by 52 ft. long.

Cores are loaded and unloaded at the same point with open work-areas on *all* sides, and entire design provides excellent production per foot of floor-space, straighter coremaking lines and highly economical use of labor, time and fuel.

CHECK THESE FEATURES!

1. **Multi-pass conveyor** (see diagram) makes efficient use of baking-chamber space. Carries 38 racks. Allows compact design.
2. **Recirculates up to 75%** of heated air. Saves fuel. Bakes cores fast and uniformly.
3. **Built-in cooling** section makes handling of baked cores easier and saves time in production of castings.
4. **Single loading area** for both loading and unloading saves labor. Note convenience in putting cores on racks.
5. **Platform mounted heater,** fans, gear boxes and controls gives more open working space on main floor.



Cores are loaded on racks at lower left, then are carried by continuous conveyor up to baking chamber.

Two horizontal passes are made through baking chamber. Cores then enter built-in cooling section and are quickly cooled by special fans. Racks are unloaded at lower right as shown.

Baking is fast and uniform using forced convection heat. Has combination gas and oil-fired high efficiency heater. Heat is circulated by powerful high volume fan. Special exhaust fan is also provided.

Has variable-speed conveyor and automatic heat control.

MAIL THIS COUPON TODAY!

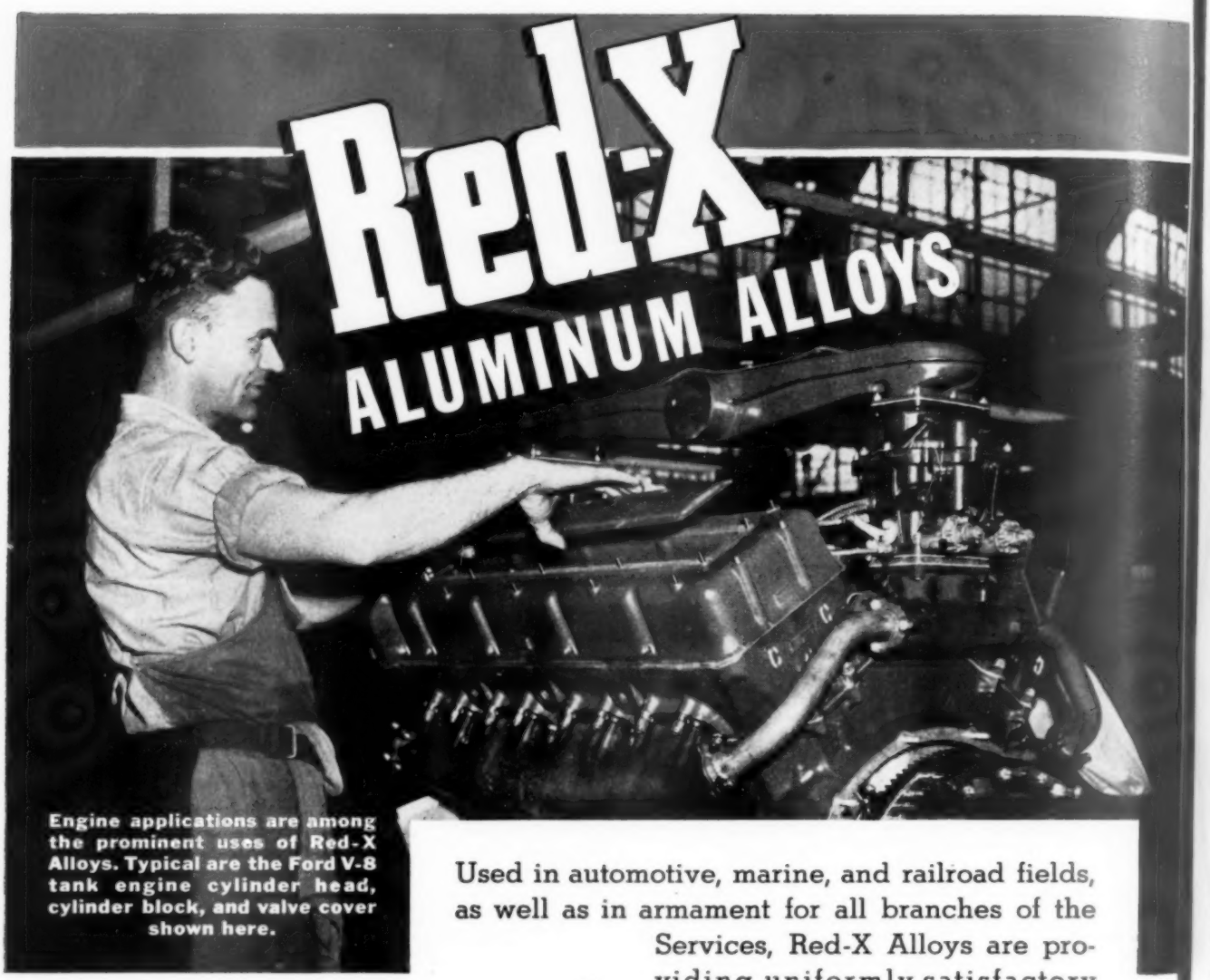
DESPATCH
OVEN COMPANY MINNEAPOLIS

DESPATCH OVEN CO.
619 S.E. 8 Street, Minneapolis 14, Minn.

Please send me free illustrated pamphlet describing NEW Despatch Conveyor-Type Foundry Ovens. Also send further details about multi-pass oven shown in your ad.

Name _____
Company _____
Position _____
Address _____
City and State _____

Red-X ALUMINUM ALLOYS

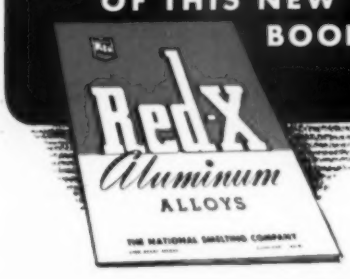


Engine applications are among the prominent uses of Red-X Alloys. Typical are the Ford V-8 tank engine cylinder head, cylinder block, and valve cover shown here.

Field Tested and APPROVED

Used in automotive, marine, and railroad fields, as well as in armament for all branches of the Services, Red-X Alloys are providing uniformly satisfactory performance. From the standpoint of design requirements, and the advantages of good castability and machinability, these alloys are without equal in their field. Most important, Red-X Alloys meet the physical requirements of many alloys with low impurity limits, and do not have extreme sensitivity to contamination.

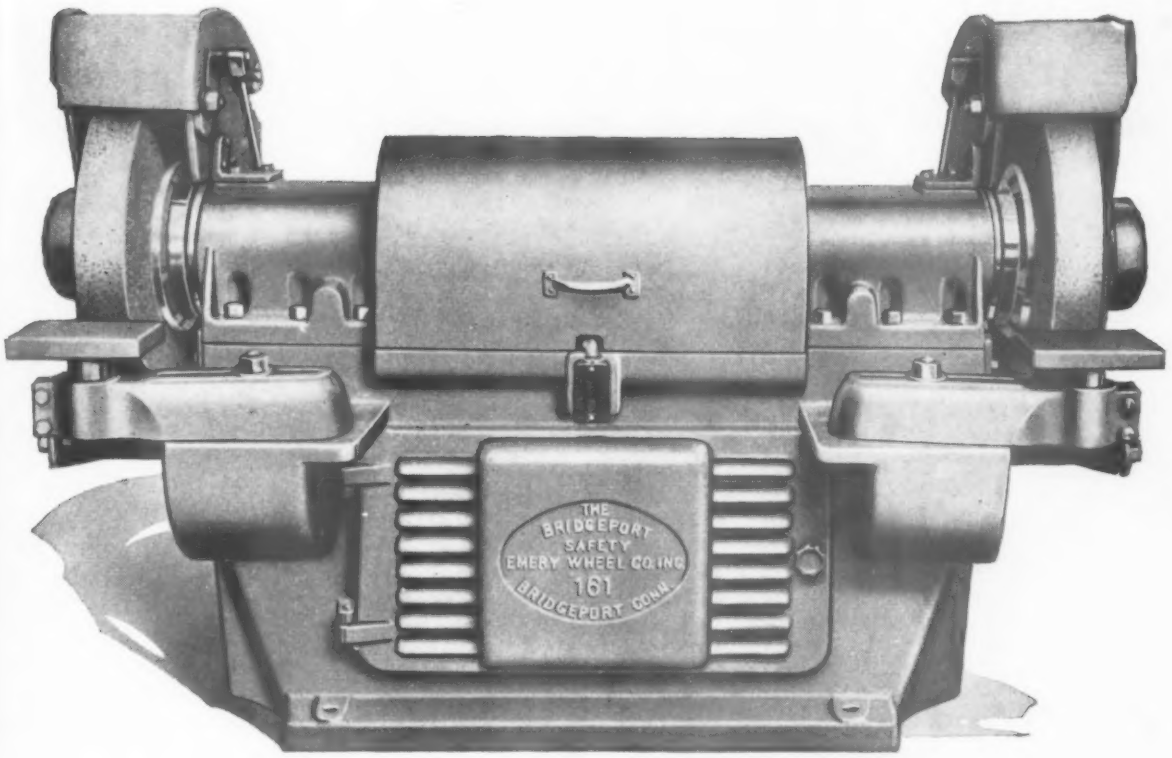
WRITE FOR A COPY OF THIS NEW BOOKLET



If you want Aluminum Alloys that will provide good production and use performance along with *economy,* inquire about Red-X Alloys . . . today.

THE NATIONAL SMELTING CO.
6706 GRANT AVE. • CLEVELAND 5, OHIO

National **SMELTING**



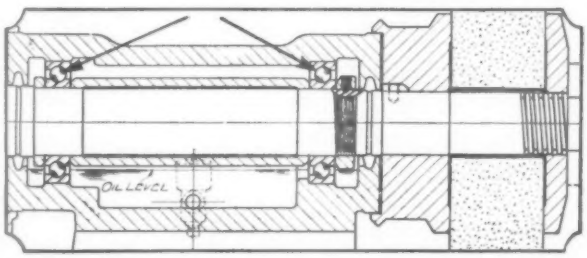
"BRIDGEPORT" No. 161 HIGH SPEED FLOOR GRINDER

High Speed was Designed into this Grinder!

In this grinder, high speed means more than high motor speed. Throughout the design, stresses and strains are so "guided" that shock is neutralized, even under rough treatment, and vibration is absorbed, even should the wheels get unequal wear. Three controlled speeds maintain the correct speed range throughout the life of the wheels—a very important point in wheel economy. Also—large-hole wheels are used, which can be worn down almost to the flanges; only an exceedingly small amount of abrasive need ever be thrown away.

These and many other mechanical refinements assure long service life, high production, and exceptional operating economy in "Bridgeport" High Speed Floor Grinders.

4 SETS OF OVERSIZE BALL BEARINGS



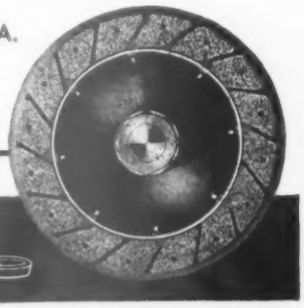
PRINCIPAL ADVANTAGES OF "BRIDGEPORT" HIGH SPEED GRINDERS

- Scientifically designed for high speed Resinoid wheels
- Speed control and speed variation, for wheel economy
- Rugged construction that withstands extremely heavy loads
- Timken spindle design eliminates end play and vibration
- Absolute protection against over speed
- Protection against slow, expensive wheel speeds
- Easy belt changing mechanism
- Positive protection against excessive belt tension
- High efficiency through low power consumption and maintenance

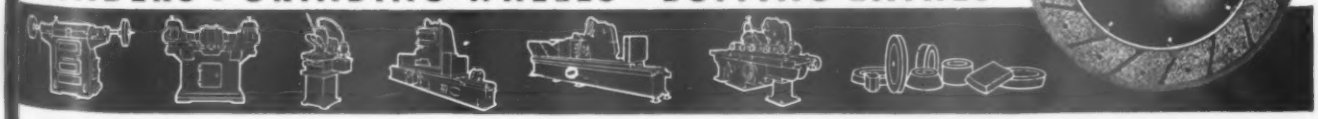
Complete Information on Request

THE BRIDGEPORT SAFETY EMERY WHEEL CO., INC., BRIDGEPORT, CONN., U. S. A.

Bridgeport



GRINDERS • GRINDING WHEELS • BUFFING LATHES



FANNER CHAPLETS

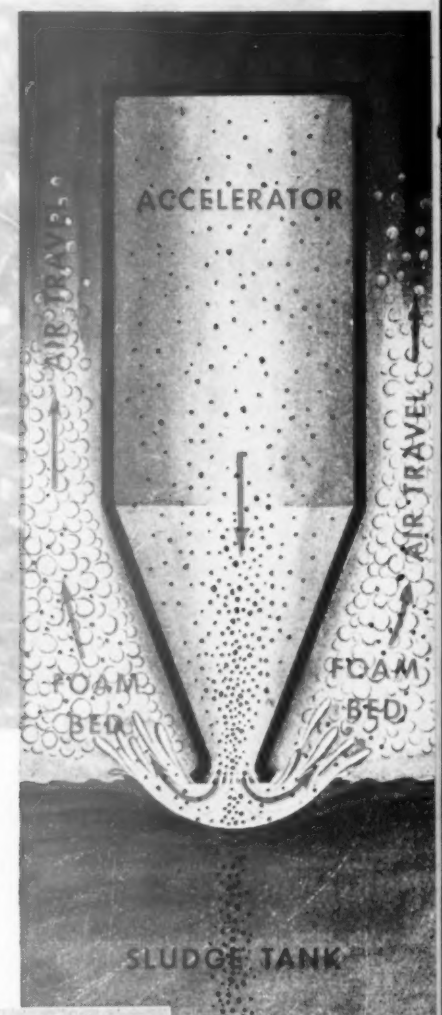
Whatever your CHAPLET requirements may be, there is a FANNER CHAPLET to fit the job.

THE FANNER MANUFACTURING COMPANY, CLEVELAND 1, O.

THE CANADIAN FANNER LTD., HAMILTON, ONTARIO, CANADA

It's the FOAM that does it!

MAHON Hydro-Foam DUST COLLECTING SYSTEM

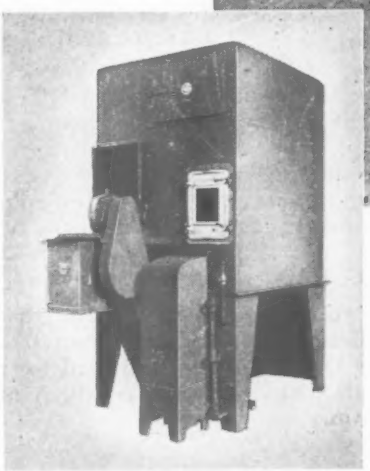


REMOVES THE DUST FROM INDUSTRY

Even the finest dust particles are removed by the MAHON *patented* FOAM CONTROL

The *Hydro-Foam* principle of Mahon Dust Collecting Systems is the key to their exceptional effectiveness in service. Even the finest dust particles *—the most dangerous to workmen* and work—are captured and permanently trapped *under water.* Control of this foam action has been achieved only after many years of continuous research by Mahon engineers.

Three separate stages of dust elimination are accomplished. 1) By means of a powerful suction-exhaust fan—the only moving part—the dust-laden air is drawn from working areas into the unit where heavier dust particles drop by gravity into the sludge tank, located in the base. 2) Still carrying a considerable volume of dust, the air stream then enters a battery of accelerators, which direct the air downward at high velocity, forcing the bulk of the remaining dust into the treated water in the sludge tank. 3) This impinging action aerates the sludge tank solution and forms a bed of foam *above the water line.* (See illustration to right.) As the air stream passes through this foam bed the more minute dust particles are "smothered" and settle to the bottom of the sludge tank with the heavier dust previously removed. Air emerges from the exhaust stack thoroughly cleaned.



Mahon *Hydro-Foam* Dus Collectors are adaptable t practically every industr and every purpose. If yo are interested in this ad vanced method of automati dust elimination, whos greater effectiveness, simplic ity and economy definitel have been proved in practic write for descriptive folde

THE R. C. MAHON COMPANY

DETROIT 11 — CHICAGO 4

Manufacturers of Metal Cleaning Machines • Rust Proofing Machines • Hydro-Filter Spray Booths • Ovens of All Types • Filtered Air Supply Units • Hydro-Foam Dust Collectors—and Many Other Units of Special Production Equipment—including Complete Finishing Systems

GEHNRICH FOUNDRY OVENS

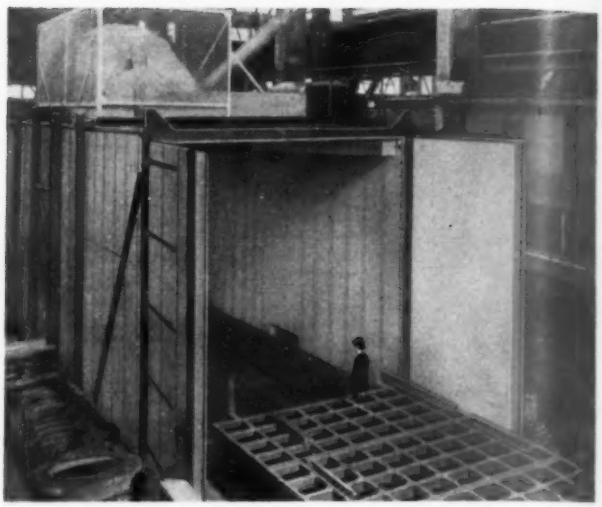
REDUCE CORE BAKING COSTS

UNIFORM BAKING PRODUCES UNIFORM CORE OR MOLD QUALITY AT LOWER HEATING COST

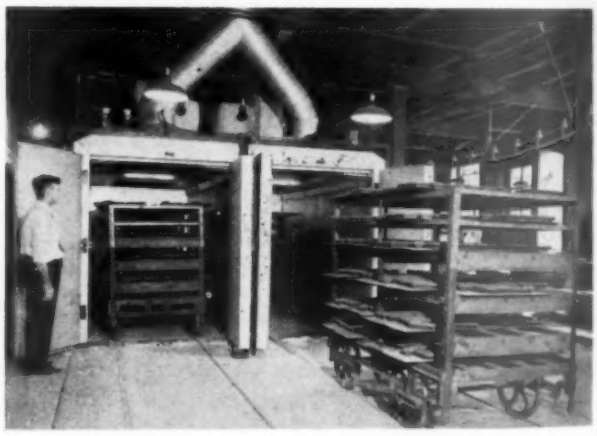
● It wasn't so long ago that acceptable core baking practice meant shoving a load into an oven, turning on the heat and "letting her stew" all night. Thousands of ovens in use today are still operating on such a hit-or-miss basis, without assurance that the cores in the middle of the batch get the same kind of baking as those on the ends, with the result that the quality of cores in each batch varies all over the lot, with consequent operating losses.

● Modern Core Baking—as practiced in Gehnrich Ovens—means that, with due regard for mass, size or quantity of cores or molds, high speed, recirculated hot air at the right temperature, is applied to and through all the load and the vapors are removed at a controlled rate. This assures uniformly baked product with maximum core output for the heat input and elimination of losses due to improper baking. Add to that the fuel saving and operating values of Gehnrich Dual Panel construction and you come nearest to the ideal of maximum, high quality production at minimum operating cost.

● Whether your work load is 100 lbs. or 100 tons—to be heated in batches or continuously—let Gehnrich Oven Engineers build for you the oven that will improve your product and your profit statement.



This large Gehnrich internal gas fired, recirculating heating oven (39 ft. long, 16 ft. wide, 17 ft. high) dries a net load of 40 tons of molds. Despite a dead weight flask and car load of 100 tons, thorough drying with protective interlocking fuel, air, temperature and ventilation control, assures maximum production and safety with minimum fuel consumption.



Gehnrich core oven for two trucks in each compartment; recirculating convection heating with complete safety interlocking controls for heater, circulation and ventilation of oven produces safe, fast, thorough baking of assorted cores.

Write for the Foundry Oven Book

GEHNRICH OVEN DIVISION

W. S. ROCKWELL COMPANY

Batch Type and Continuous Ovens

56 CHURCH STREET NEW YORK 7, N. Y.

CORE BAKING
MOLD DRYING
ANNEALING
HEAT TREATING
BAKING COATINGS
PROCESS DRYING

Foundry METAL CUTTING MACHINE

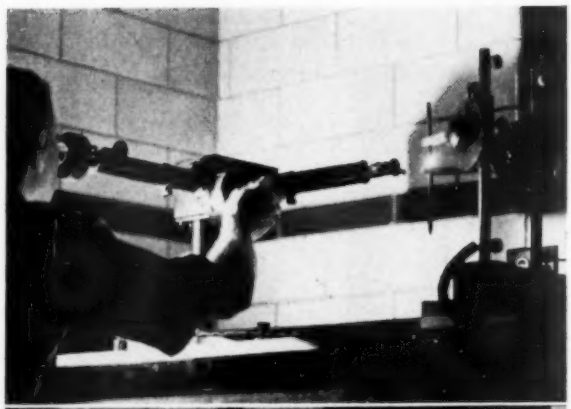
Keeping ahead of trends in the processing of magnesium and aluminum castings, DeWalt introduces this specially designed machine for removing gates and risers. Completely new in foundry methods, this DeWalt puts the cleaning room *on a production schedule* and increases the efficiency of the entire foundry. Write for descriptive literature.

DE WALT PRODUCTS CORPORATION
LANCASTER, PENNSYLVANIA

Aluminum ALLOY INGOT

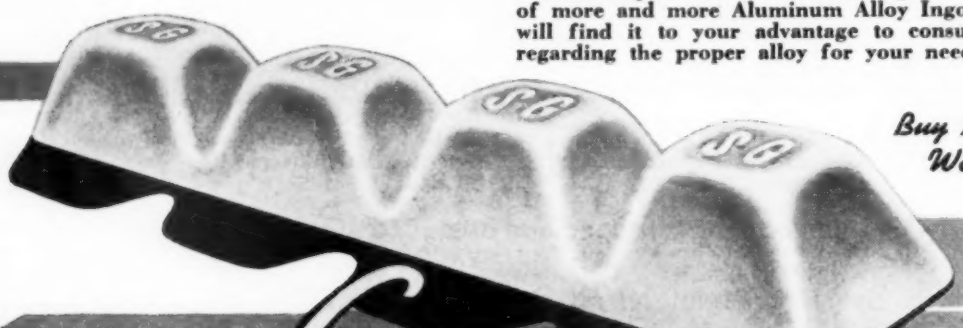
...THESE MEN Are WORKING for *You!*

even though they are on OUR PAY-ROLL. The technical "Know How" of our skilled laboratory technicians, enhanced by the most modern testing equipment available to the industry, is working for YOU day and night. We employ these men to make certain that every specification requirement is met on every Sonken-Galamba Aluminum Alloy Ingot. The result... uniformity of composition without variance. Take advantage of hazard free, increased production schedules, made possible by the use of our Aluminum Alloy Ingots.



Civilian requirements are now being met by the use of more and more Aluminum Alloy Ingot . . . you will find it to your advantage to consult with us regarding the proper alloy for your needs.

Buy More War Bonds



SONKEN-GALAMBA Corporation

(MEMBER ALUMINUM RESEARCH INSTITUTE)

Riverview at 2nd Street · Kansas City, 18, Kansas

Permanent Dust Control at the Lowest Overall Cost

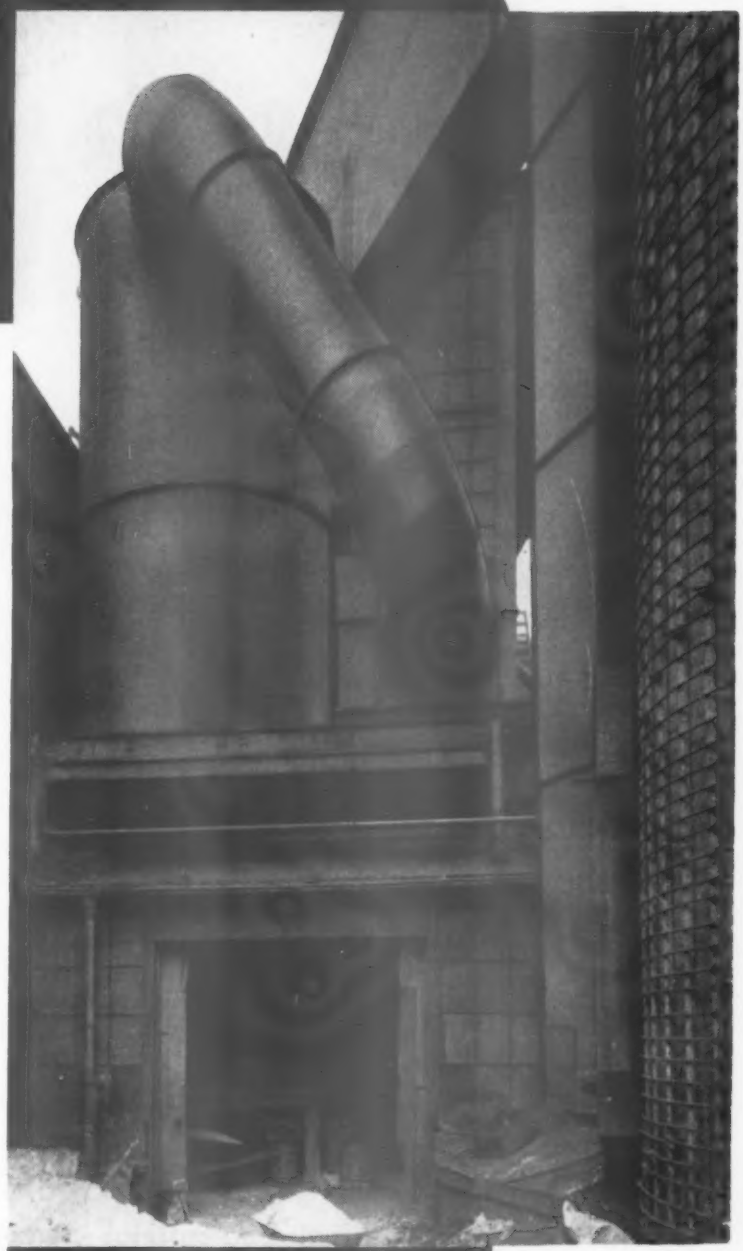
When a Schneible Multi-Wash System is installed in a foundry, the dust and fume problem becomes a closed issue. So little attendance and maintenance are required that users forget they have a Schneible; while year after year it maintains the clean air in the working zones, which is so essential to maximum worker efficiency and output.

All costs considered over a period of years, Schneible Multi-Wash Collectors give the highest constant efficiency dust control at the lowest overall cost.

Schneible Collectors use plain water to cleanse contaminated air. The water can be reclaimed in Schneible Dewatering Tanks and used over and over again. The collected matter, as sludge, requires far less care and labor for disposal than an accumulation of dust. There are no moving parts in Schneible Collectors—no parts to break, burn, clog, rapidly wear or require periodical cleaning. Once switched into operation, the collector will function indefinitely at constant volume. No other dust control equipment provides all of these advantages.

Schneible Multi-Wash Dust Collectors are available in standard units up to 30,000 c.f.m. for every requirement, from maintaining clean air in an entire foundry down to dust control for a troublesome individual operation. Write for informative bulletins.

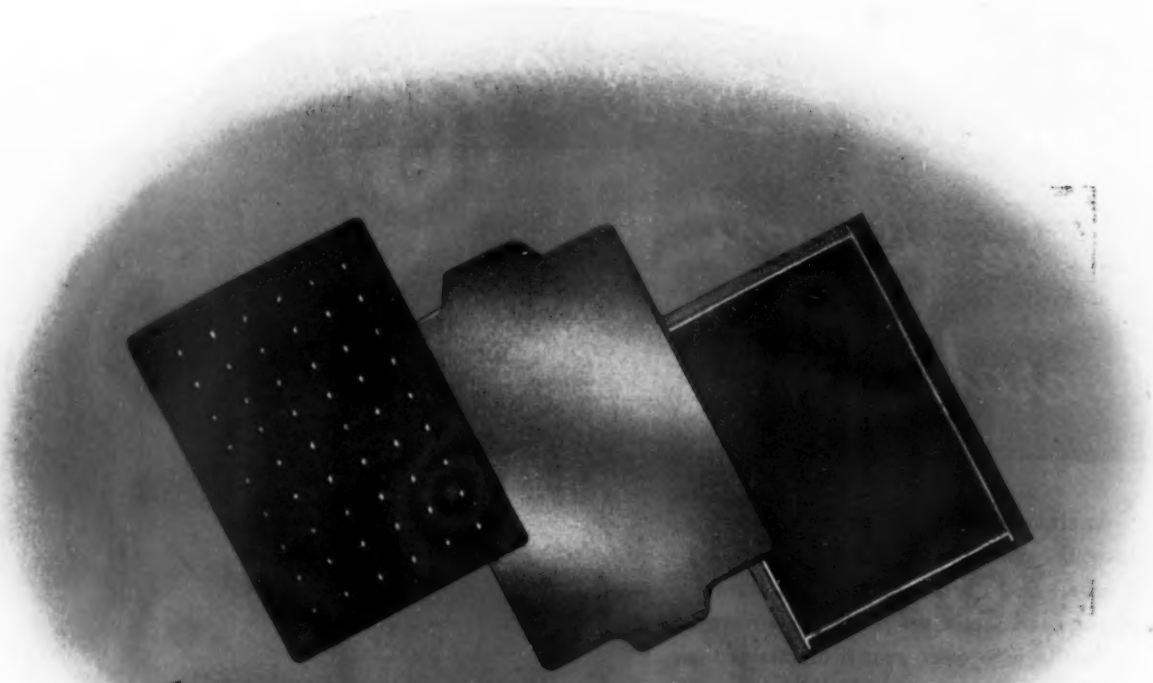
CLAUDE B. SCHNEIBLE CO.
2827 Twenty-Fifth Street
Detroit 16, Michigan
Engineering Representatives in Principal Cities



One of a group of Schneible Collectors, with a total capacity of 90,000 c.f.m., which keep the air in a steel foundry clean.

SCHNEIBLE

LIQUID-VAPOR INTIMATE CONTACT EQUIPMENT for DUST COLLECTION ABSORPTION CONDENSATION AND TEMPERATURE REDUCTION



Perfect Castings

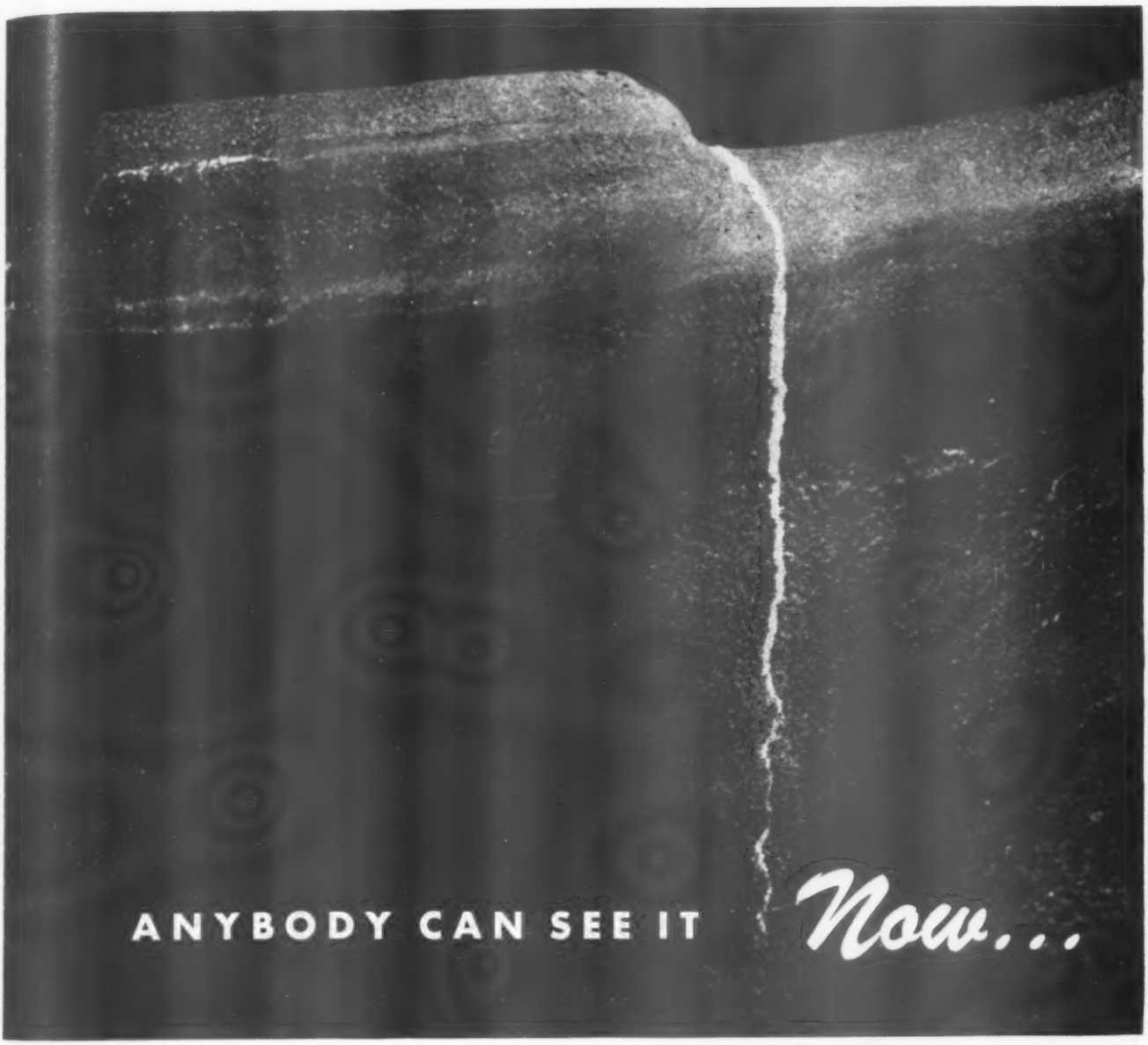
Require Best of Plates

Moltrup flattened steel pattern, core and bottom plates are made in all standard sizes and shapes or can be tailormade to fit any foundry requirement. Their fine quality will help guarantee fault-free castings in your plant.

★ ★ ★ **MOLTRUP** ★ ★ ★

STEEL FOUNDRY PLATES

MOLTRUP STEEL PRODUCTS CO., BEAVER FALLS, PA.
(PITTSBURGH DISTRICT)



. . . With the Aid of Magnaflux* Indications

MAGNAFLUX RESEARCH

Since the pioneering stage of the original Magnaflux Method for steel, our engineers have sought to extend the benefits of rapid non-destructive inspection techniques in every field. For the important foundry industry special portable equipment and new procedures for more sensitive results were developed.

• Any workman, foreman or executive could have been forgiven in the old days for allowing this gray cast iron generator housing to leave the foundry. Yet, on inspection by the Magnaflux* Method a large shrinkage crack shows up clearly. The part is defective, plainly marked for trouble —later—when the whole generator must be torn down.

The business advantage of being able to spot sub-standard parts and trace their causes is enormous. With Magnaflux every piece and part can be examined in the foundry for shrinkage cracks, porosity, blow-holes, scabs and surface cracks. Surface indications are obtained which indicate all surface and many sub-surface flaws.

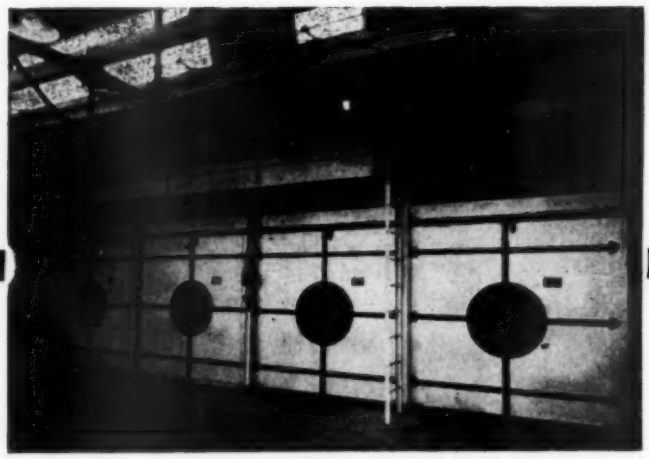
For the more competitive business weather which lies ahead, it's a sound move, now, to look into the possibilities of Magnaflux in your business. Just write us that we may send an explanatory bulletin.

**Magnaflux—the Trade Mark of the Magnaflux Corporation applied to its equipment, materials and methods for magnetic particle inspection.*

MAGNAFLUX CORPORATION

5918 Northwest Highway, Chicago 31, Illinois

New York • Detroit • Dallas • Los Angeles • Cleveland • Birmingham

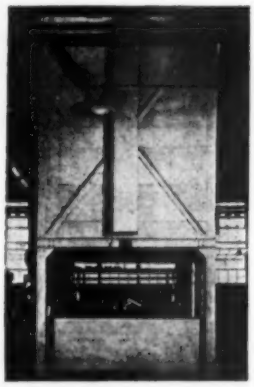


One of several batteries of Carl-Mayer Oil Fired Recirculating Air Heater Type Core Ovens at American Magnesium Division of Aluminum Co. of America.

CARL-MAYER

CREATIVE ENGINEERING

Carl Mayer achievements in core baking and mold drying have received the best recognition of all—repeat order after repeat order from America's leading foundries—in face of wide competition. Investigate! You, too, will find it a wise move to consult Carl Mayer when in the market for new or additional core and mold oven equipment. Write for Bulletin 141.



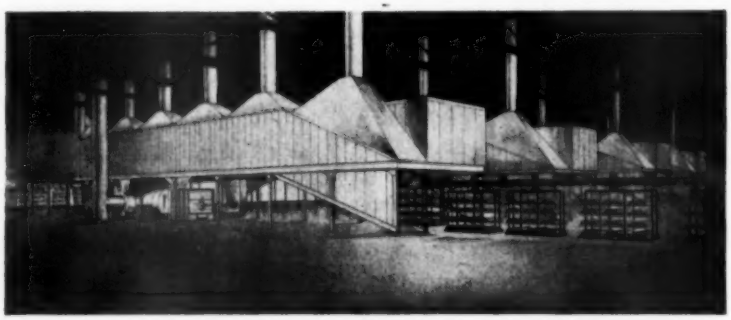
THE CARL MAYER CORP.
3030 Euclid Ave. Cleveland, Ohio

•

MR. LESTER SEELIG
District Representative
185 North Wabash Ave., Chicago 1, Illinois

•

Left—Typical Large Carl-Mayer Vertical Oven as installed for Electric Autolite, Fremont Foundry, Cadillac, General Motors and Packard Motor Co.



4 of the largest Continuous Monorail Core Ovens in U.S.A. for Ford Motor Co. each 170' long.

SERVING *Customers like these*

Aluminum Co. of America
American Magnesium Corp.
American Radiator & Standard Sanitary Corp.
Babcock & Wilcox Co.
Bridgeport Brass Co.
Bucyrus-Erie Co.
Brown Industries Corp.
Dunkirk Radiator Co.
Eclipse Aviation Division of Bendix Aviation Corp.
Electric Autolite Co.
Ford Motor Co.
Fox Furnace Co.
Fort Pitt Steel Casting Co.
Frank Foundries Corp.
Fremont Foundry Co.
G & C Foundry Co.
General Motors Corp.
General Electric Co.
Gilbert & Barker Co.
International Heater Co.
Packard Motor Co.
Shenango Penn Mold Co.
Studebaker Corp.
Whiten Machine Works
Whiting Corp.

•

CORE AND MOLD OVENS

All types All sizes

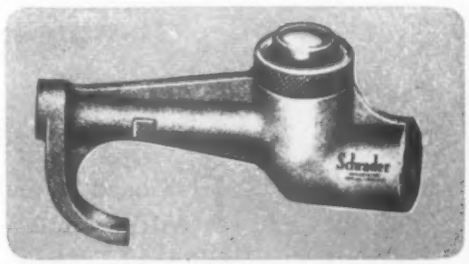
though he's not a carrier pigeon, there's a message "up his sleeve"

You are looking at a bird who knows how to go places and do things with natural air.

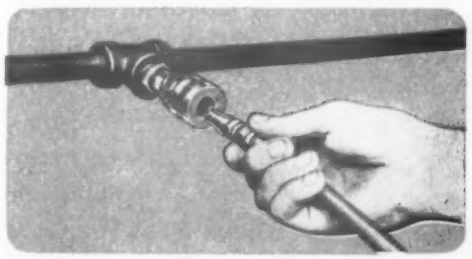
You, too, can do many things with air... compressed air. And you can do them cheaply, quickly, safely, and effectively if that air is properly controlled.

Years ago, Schrader dispelled the old bugaboo of air losses, substituting controlled, intermittent blasts for wasteful constant flow. Since then Schrader has developed hundreds of devices for the control and use of air. So saving are these devices that you can often multiply your jobs for air *without* adding to your compressor capacity.

Two of the many Schrader contributions to air power are Blow Guns and Air Couplers. All Schrader blow guns and air couplers shut off automatically and instantly when released, conserving high pressure air. For all the advantages of Schrader blow guns and air couplers, write in for Bulletin A-12Q.



TOP: Drop forged stainless steel blow gun, one of numerous Schrader types. Drop-tested from 11-story building for ruggedness. 8 different interchangeable noses available.



BOTTOM: Schrader Heavy Duty Air Line Coupler, quick acting, air tight, automatic shut-off.

Air Valves 2, 3, 4-way • Machine Operating Air Controls • Quick-acting Couplers • Blow Guns • Safety Operating Controls • Air Ejection Sets • Hydraulic Gauges

MADE BY THE MAKERS OF SCHRADER TIRE VALVES AND GAUGES

Schrader
REG. U.S. PAT. OFF.
CONTROLS THE AIR

A. SCHRADER'S SON, *Division of Scovill Manufacturing Company, Incorporated,* BROOKLYN, NEW YORK

IT'S hard to realize that the United States of tomorrow will include about 60,000,000 working men and women. To keep such a labor force gainfully occupied means high-speed, low-cost production to hold prices down and volume up.

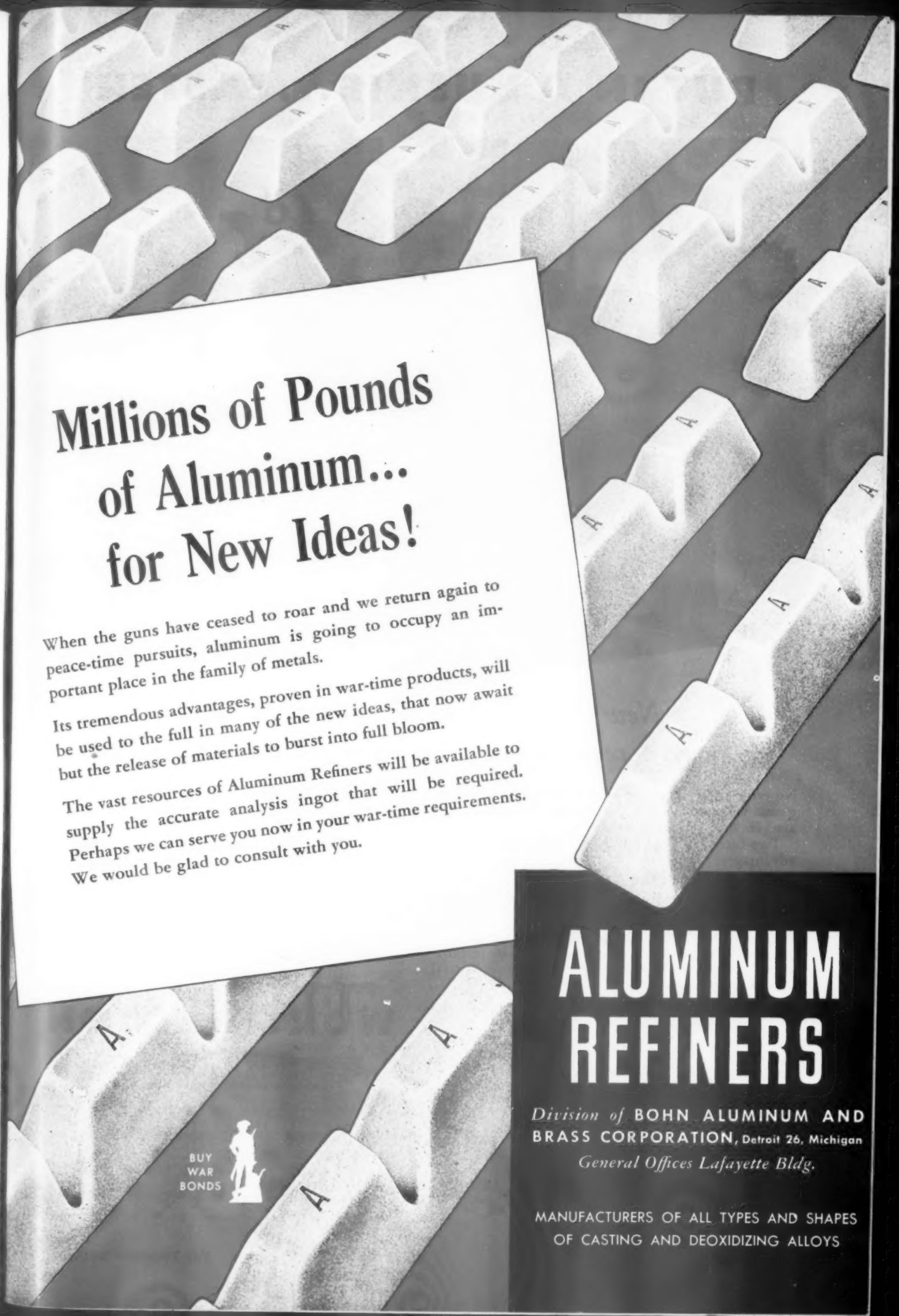
In this better, bigger, busier world of tomorrow you can profit by the experienced engineering advice that is one of the most important factors in Acme service. We design and make special tools to operate exclusively on your product and processes. We also manufacture dies, patterns, gages and fixtures. And, we produce to your specifications heat-treated aluminum castings that have no superior in their field.

Acme service to the metal-working industry is complete. Your inquiry will receive prompt attention.

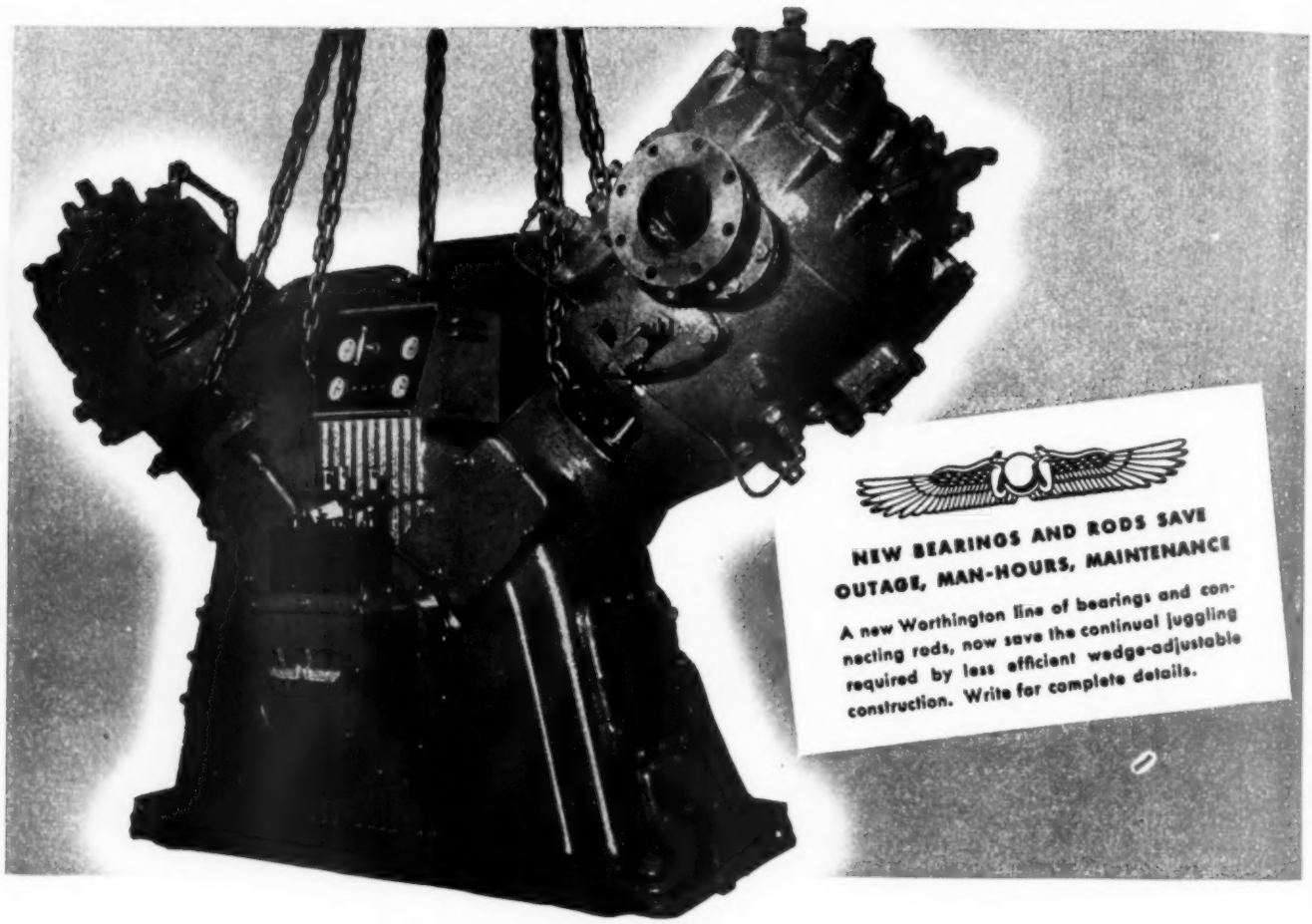
FOR VICTORY
BUY
WAR BONDS
AND STAMPS

ACME *Pattern and Tool Company, Inc.*
DAYTON, OHIO

HEAT-TREATED ALUMINUM CASTINGS...PATTERNS...TOOLS...TOOL DESIGNING...PRODUCTION PROCESSING


Millions of Pounds of Aluminum... for New Ideas!
When the guns have ceased to roar and we return again to peace-time pursuits, aluminum is going to occupy an important place in the family of metals.
Its tremendous advantages, proven in war-time products, will be used to the full in many of the new ideas, that now await but the release of materials to burst into full bloom.
The vast resources of Aluminum Refiners will be available to supply the accurate analysis ingot that will be required. Perhaps we can serve you now in your war-time requirements. We would be glad to consult with you.
BUY WAR BONDS
ALUMINUM REFINERS
Division of BOHN ALUMINUM AND BRASS CORPORATION, Detroit 26, Michigan
General Offices Lafayette Bldg.
MANUFACTURERS OF ALL TYPES AND SHAPES OF CASTING AND DEOXIDIZING ALLOYS

PUT IN A HUSKIE...FASTER


NEW BEARINGS AND RODS SAVE OUTAGE, MAN-HOURS, MAINTENANCE
A new Worthington line of bearings and connecting rods, now save the continual juggling required by less efficient wedge-adjustable construction. Write for complete details.

New Worthington YC "packaged" unit meets 4 requirements of modern compressor design

No erecting engineer, no special foundations are required when you install this Huskie. It comes packaged for quick installation.

Two-fisted "Y" design gives you these four big advantages:

1. ***Higher Speeds.*** Vertical Y-frame for perfect balance and higher r.p.m. Rugged construction, for continuous high speed operation.

2. ***Ease of Installation.*** 75% less foundation space than horizontals of the same capacity. Quick, safe installation — even where subsoil is poor—without special clamps or engineering service.

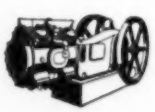
3. ***Accessibility of parts.*** Quicker, easier periodic inspections. Large handy openings. Valves outside, for accessibility. Full-floating metallic packing easily reached.

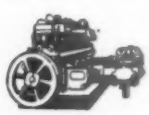
4. ***Adaptability to many drives.*** Flanged type, synchronous or induction motors, directly mounted on compressor shaft. Easily arranged for Multi-V-Drive or for coupled drive from explosion-proof motor or practically any type of rotative power.

Write for free Bulletin L–667–B1. *Worthington Pump and Machinery Corporation, Harrison, New Jersey.*

WORTHINGTON *BEHIND THE NAME* **WORTHINGTON**

NO OTHER COMPRESSOR WILL OUTPERFORM A WORTHINGTON





This is what one SMZ Alloy user thinks of this Ladle Addition alloy

"I have used many types of graphitizers, but in my opinion, SMZ Alloy is the most effective. To us, it is most desirable for the following reasons:

(1) It has a low melting point, which means thorough solution when added to the ladle.

(2) It requires less amount to do the work.

(3) It produces a fine-grained machinable iron.

(4) It reduces chill and hardness, and at the same time, increases tensile strength. Other graphitizers reduce hardness and strength together. This is the most remarkable property of SMZ Alloy to me, and in my experience, a very unusual and most desirable one."

Have you tried SMZ Alloy in your Iron?

You can get further information on SMZ Alloy by writing for the booklet "SMZ Alloy and Its Uses as a Ladle Addition to Cast Iron." If you need technical help in its use ask the nearest Electromet field metallurgist. They are located in New York, Pittsburgh, Detroit, Cleveland, Chicago, Birmingham, and San Francisco.

BUY UNITED STATES WAR BONDS AND STAMPS

ELECTRO METALLURGICAL COMPANY
Unit of Union Carbide and Carbon Corporation
30 East 42nd Street UCC New York 17, N. Y.
In Canada: Electro Metallurgical Company of Canada, Limited, Welland, Ontario

Electromet
Trade Mark
Ferro-Alloys & Metals

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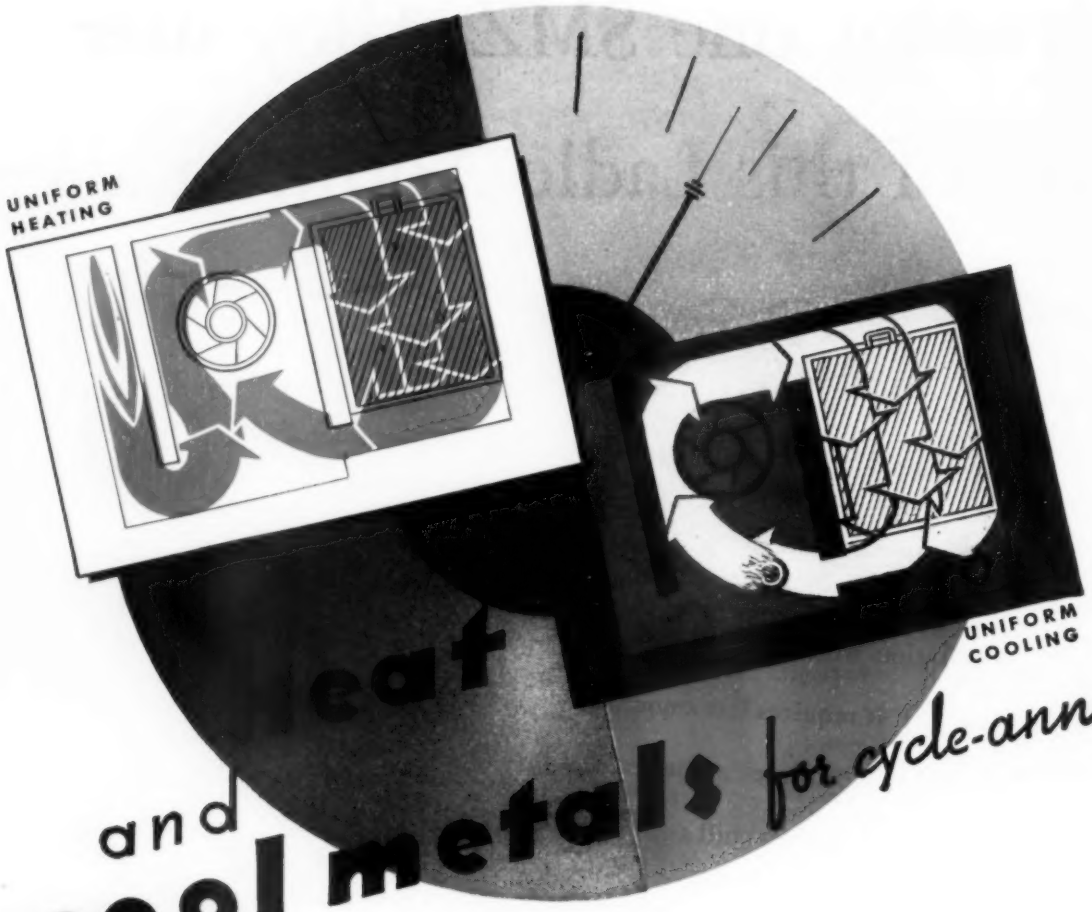

Heat and cool metals for cycle-annealing

at precise temperatures with *fan driven* air!

Operating with fan driven air under terrific velocity from an isolated heat source, the Lindberg recirculating furnaces are able to do surprising things in the heat-treating field.

Because the heat source is outside the treating chamber, there is no radiant heat to distort outside pieces in the load, temperatures can be pre-arranged and an "automatic program control" set up for both heating and cooling without withdrawing the load from the furnace.

Cutting the heat source and continuing the fan allows quick and controlled cooling with the same exactness as the heating. Cycle-annealing, spheroidizing or isothermal transformation becomes simple and practical with the Super-Cyclone. In fact, every angle of heat treating shows an advantage with this remarkable furnace—it does work faster with a minimum of correction; it saves time, floorspace and manpower; it provides, in the same furnace, normalizing or annealing, hardening, or tempering. Write to Lindberg Engineering Company, 2453 West Hubbard Street, Chicago 12.

ARMY E NAVY

Lindberg FURNACES

SUPER-CYCLONE for hardening, normalizing, annealing, tempering

CYCLONE for accurate, low-cost tempering and nitriding

HYDRYZING for scale-free and decarb-free hardening

Aluminum and Magnesium, Inc.
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Niagara Falls Smelting & Refining Corp.
Buffalo 17, New York

Sonken-Galamba Corporation
Kansas City 18, Kansas

U. S. Reduction Co.
East Chicago, Indiana

"Savvy," the pilot calls it . . . the sure knowledge of his plane, the operations to be undertaken, and attention to the many details that fit him for successful combat. Skill or "know-how" it is called in industrial life—but by any term, it all adds up to the same thing.

Aluminum Research Institute members are constantly developing methods and techniques in the production of aluminum alloys designed to fit the purpose for which they are to be used. The pilot does not fly by blind luck, nor are satisfactory aluminum alloys produced by neglecting details. Our experience, techniques, and attention to details enables us to produce aluminum alloys fit to fight your battles in industrial life.

Any of our members will be glad to consult with you on the adaptability of aluminum alloy castings to the product you are manufacturing. There is a wealth of skill and experience available to you. Why not take advantage of it?

BUY BONDS

Aluminum Research Institute

111 West Washington Street, Chicago 2, Illinois

TAM ZIRCONITE PRODUCTS AVAILABLE

TAM
Foundry Zirconite Sand (in three grades)
Melting Points from 3650° F to 3950° F

TAM
Foundry Zirconite Flour (in two grades)
Melting Points from 3650° F to 3812° F

TAM
Foundry Zirconite Mold and Core Washes (in three grades)
Super-refractory compounds with melting points from 3600° F to 3775° F

GENERAL OFFICES AND WORKS: NIAGARA FALLS, N. Y., U. S. A.
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TABOR
TRADE 1884 MARK

TABOR-BRASIVE CUT-OFF MACHINES

Users say . . .

". . . We highly recommend the Cut-Off Machine which we purchased from you a few months ago. It is a real saving in time, money and labor. Before we purchased this machine, we used saws and this process was long. The machine saves us both time and labor as it cuts the castings much quicker and better. We have also eliminated the heavy expense of the band saws and we find that the expense connected with the machine is far less than the amount of the saws used . . ."

And

". . . advising you again how pleased we are with the machine. It has been running steadily since we received it in June (two months) without a single break-down of any sort, and it has made hundreds of cuts during this time.

. . . Assuring you that at any future time we may be in need of machines of this nature, we will certainly contact you first, we are, etc."

Tabor-Brasive Cut-Off Machines save time, money and labor in cutting gates and risers from castings of manganese bronze, nickel, Monel and other non-ferrous alloys, as well as alloy steel. Built in a complete line of sizes and types to meet any cutting need.

THE TABOR MANUFACTURING COMPANY
6225 Tacony Street • Philadelphia • Pennsylvania

Representatives: Snyder Foundry Supply Co., *Los Angeles, Calif.;* Pacific Graphite Works, *Oakland, Calif.;* Carl F. Miller & Co., *Seattle, Wash.*

How to pull HEAVIER PRODUCTION out of "Thin Air"!

Simple Foxboro Air-Weight Controller installations like this increase output per cupola by ½ to 1 ton daily!

Even First Pours produce top-grade castings ...with Foxboro Air-Weight Control

UNLESS you've watched cupolas operate with Foxboro Air-Weight Controllers on the blast, it's hard to realize how much this simple, inexpensive installation can improve production!

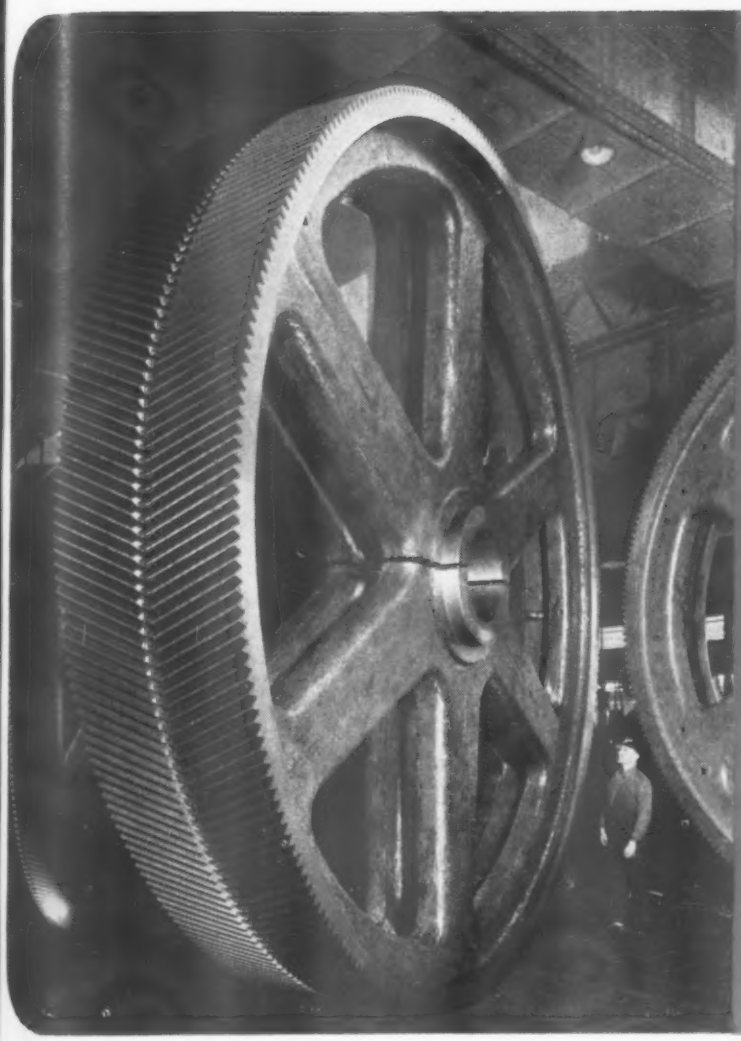
Here's why. The Foxboro Air-Weight Controller is an automatic instrument that exactly controls the blast by *weight* of air, instead of volume. Set it for the correct air-coke ratio, and it will maintain uniform melting conditions day-in, day-out, regardless of the weather.

Heats are uniformly hotter, without burning . . . pigging is entirely eliminated. Metal characteristics are importantly improved . . . from start to finish, every pour gives flawless, quality castings. What's more, you get this better operation with an improved iron-coke ratio!

Write for Bulletin B-268 describing this easily-installed production-booster! **The Foxboro Company, 32 Neponset Avenue, Foxboro, Mass., U. S. A.** Also Montreal, Canada. Branches in principal cities.

AIR-WEIGHT CONTROLLERS BY FOXBORO

Reg. U. S. Pat. Off.



287 reasons why Chateaugay PIG IRON IMPROVES MACHINABILITY OF STEEL CASTINGS

It's true—you can't beat this low phosphorous, copper-free iron for machinability and strength.

This 39,375 lb. rolling mill gear presents a graphic example of a heavy one-piece steel casting that required extensive machining to produce its 287 accurate teeth. And every tooth had to be tough and strong.

Chateaugay Pig Iron provided the trouble-free answer—just as it has on countless other foundry jobs the country over.

This iron is not only easy and economical to turn, mill, drill or otherwise machine, but in addition is fluid. It completely fills difficult castings of intricate design—then sets quickly.

Chateaugay in the mixture makes castings of high strength. It also provides hard wearing surfaces that are resistant to heat and acids.

You've heard about the Republic pig iron metallurgist, better known as the man who's "always at your elbow." He'll be glad to call on you and tell you all about Chateaugay and how it can be used to the best advantage in your foundry. Tell us when to send him.

REPUBLIC STEEL CORPORATION
GENERAL OFFICES • CLEVELAND 1, OHIO
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Republic PIG IRON

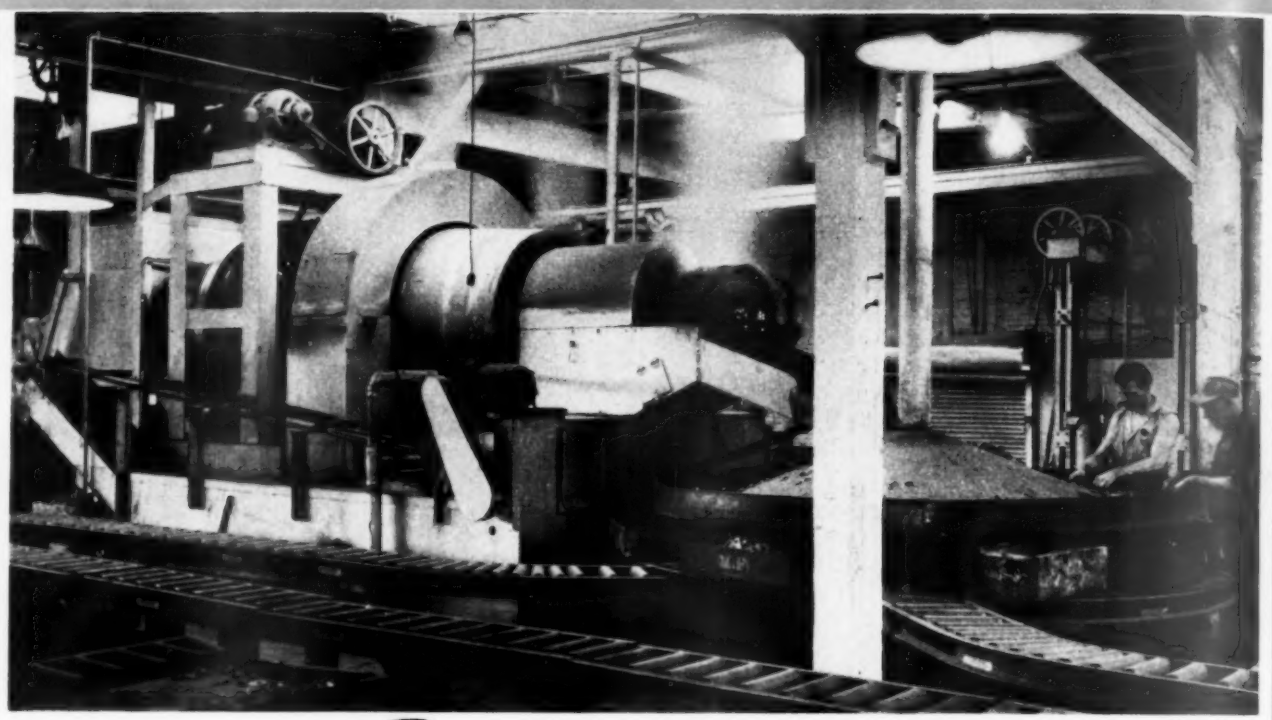
"CHATEAUGAY" Low-Phosphorus, Copper-Free

"REPUBLIC" (Northern) Foundry, Basic and Malleable

"PIONEER" (Southern) Foundry and Basic

ALSO TRUSCON FOUNDRY FLASKS—REPUBLIC CORE WIRE—FOUNDRY NAILS

Ransohoff Automatic Star-return WET CLEANING MILLS



"Increase grey iron production through modernization," says E. C. Hoenicke, Gray Iron Castings Section, War Production Board, Washington.

In the June issue of FOUNDRY, Mr. Hoenicke stated: "Use of modern cleaning machines will bring about important savings in man-hours required per ton of castings, due to faster loading and unloading and better and faster cleaning. More thorough cleaning means less re-run castings. Greater capacity per square foot of floor space area will make possible better cleaning room arrangement."

Send Us A Sample Batch: Ransohoff Engineers Will Gladly Run Tests

As proof that it pays to modernize, illustration shows an end-loading, end-unloading wet cleaning mill which replaced 24 small tumbling barrels and saves over $5,000 a year in operating costs.

YOUR BEST-PAYING INVESTMENT IS MODERNIZATION

IT may hurt to decide to replace your old-style equipment but it will feel mighty good when you install modern equipment such as Ransohoff Equipment and see work speeded, costs cut and better looking products for your customers.

As every foundryman knows when working with modern equipment, cleaner castings, faster loading and unloading, better inspection, lower maintenance costs on tools and more efficient plants are sure to result. And this is a heap better than worrying along with equipment that's a relic of the "horse and buggy" days.

TO ECONOMIZE YOU MUST MODERNIZE WITH RANSOHOFF EQUIPMENT . . . speedy . . . gentle . . . economical . . . not self-destructive . . . automatic handling of stars.

SAVE 30% to 70% ON YOUR CLEANING COSTS

N. RANSOHOFF, Inc. CINCINNATI, OHIO
Township Ave. and Big 4 R. R.

CARBORUNDUM HAS SOMETHING IMPORTANT TO SAY ABOUT *Foundry Grinding*

Foundry grinding is varied in its nature—rather wide in its scope. That is the reason for the scientific development of a group of Resinoid Wheels by Carborundum—a group that covers all foundry grinding conditions.

1. Resinoid Wheels by Carborundum are produced in a variety of abrasive grain and bond types, and structures from the extremely dense to the extremely open.
2. In grades ranging from the hardest to the softest.
3. They provide a wide range of cutting action invaluable in either maintaining high rates of production or long wheel life.

Here is a group of wheels of widely varied grinding characteristics, definitely designed to help you strike a proper balance between labor, overhead and abrasive costs in your foundry grinding room.

Resinoid Wheels by Carborundum are also designed for grinding conditions arising from the different metals and metal characteristics.

They are designed to assure high rates of stock removal commensurate with proper, logical abrasive costs.

In this group are also specially developed wheels for grinding the essential light metals such as Aluminum and Magnesium.

Resinoid Wheels by Carborundum cover the foundry grinding field—scientifically—adequately.

To get the full advantage of these wheels it is suggested that you consult with Carborundum Abrasive Engineering Service.

The Carborundum Company, Niagara Falls, New York.

Sales Offices and Warehouses in New York, Chicago, Philadelphia, Detroit, Cleveland, Boston, Buffalo, Pittsburgh, Cincinnati, St. Louis, Grand Rapids

CARBORUNDUM

Grinding Wheels by CARBORUNDUM

TRADE MARK

(Carborundum and Aloxite are registered trade marks of and indicate manufacture by The Carborundum Company)

THE UTMOST
IN DEPENDABILITY
MAKES HANNA

"the best known name in iron"

BRANDS: Buffalo . . Detroit . . Susquehanna
GRADES: Basic . . Foundry . . Malleable . . Ferro-Silicon . . Silvery

THE HANNA FURNACE CORPORATION

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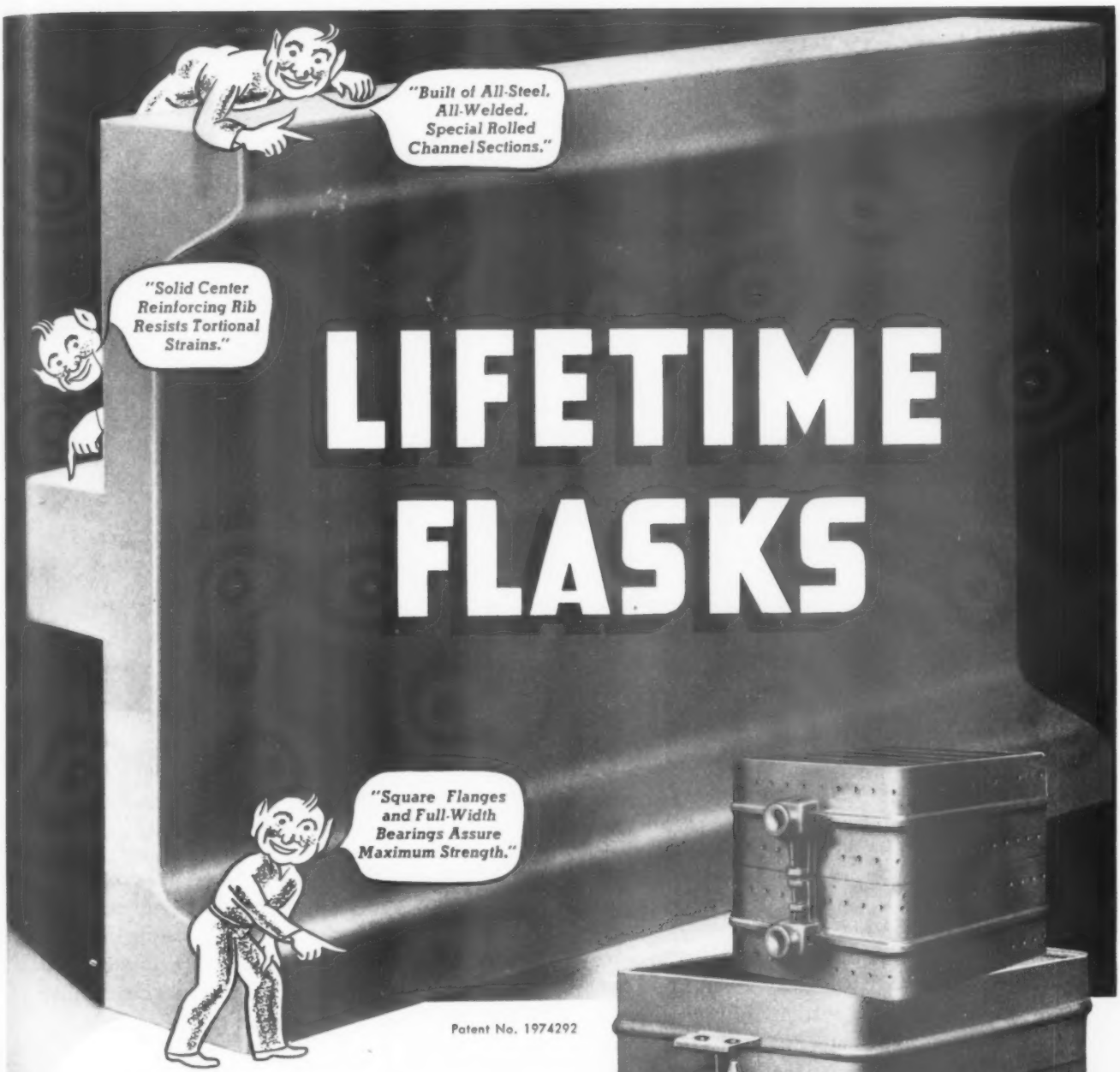
MERCHANT PIG IRON DIVISION OF
NATIONAL STEEL CORPORATION
EXECUTIVE OFFICES: PITTSBURGH, PA.

NATIONAL STEEL CORPORATION


"Built of All-Steel, All-Welded, Special Rolled Channel Sections."
"Solid Center Reinforcing Rib Resists Tortional Strains."
LIFETIME FLASKS
"Square Flanges and Full-Width Bearings Assure Maximum Strength."
Patent No. 1974292

To meet today's vital war production schedules, you need Sterling LIFETIME Foundry Flasks — flasks that are unusually compact and rugged, engineered on standards of indestructibility. That's why Sterlings are the preferred flasks in more than 3500 American foundries. All styles and shapes available.

Sterling FOUNDRY FLASKS

STERLING WHEELBARROW COMPANY • MILWAUKEE, WIS., U. S. A.

A 4087-1D

UPSETTING FOUNDRY TRADITION

. . . with revolutionary CORE OILS

When war's demands made more and better castings a necessity, core craftsmanship had to give way to mass production. Every operation in the foundry including core making had to be speeded up. Old-type core oils were on the critical list, and their results somewhat variable.

Houghton came through with oil-type core binders which partially polymerized under heat of baking, and which helped enable mass production of better castings with less rejects. In non-ferrous casting of aircraft engine parts, for example, HY-TEN Core Oils have held the lead throughout the war.

This is a continuous, never-ending job—to develop even better oils for foundries, enabling better cores . . . and better castings.

. . . with new Dry CORE BINDERS

Research on all types of binders brought us into a new field—that of dry-type binders, introduced last year, and now established as a new concept in foundry practice.

Thermo-setting plastics used in combination with inert finely pulverized material produced a binder of good strength, uniformity, easy shake-out, exceptional collapsibility, less gassing and better workability than any dry-binder previously offered.

Baking time was cut in half, baking temperatures reduced, and rejects minimized. Types of dry binders are available for use in making iron, steel and non-ferrous castings. Houghton foundry engineers are ready to be of service to you, in the interest of producing better castings.

E. F. HOUGHTON & CO.

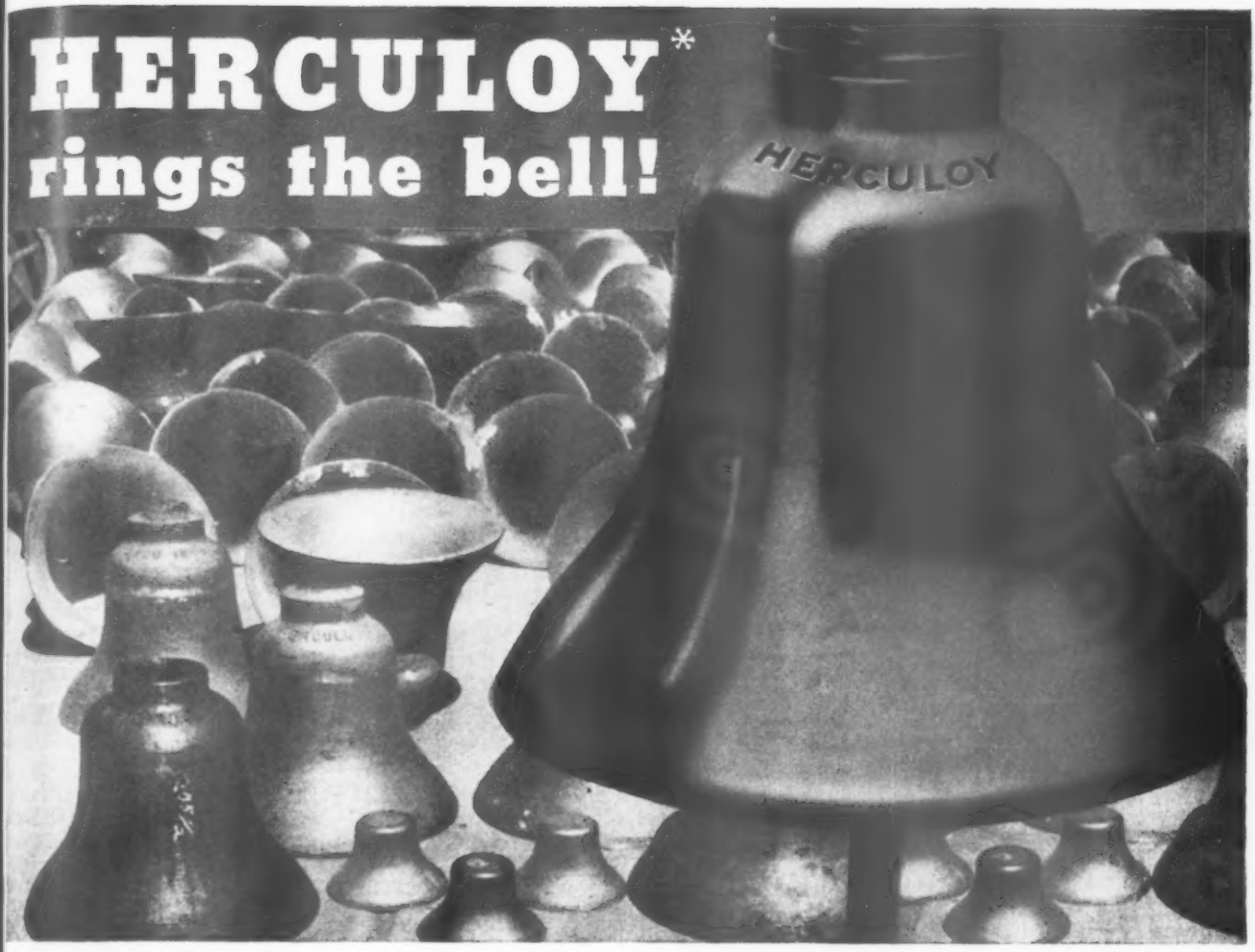
303 West Lehigh Ave., Philadelphia 33

CHICAGO SAN FRANCISCO DETROIT

HOUGHTON FOUNDRY RESEARCH HELPS

Make Better Castings

HERCULOY* rings the bell!



COPPER SILICON ALLOY replaces tin-content bronze without sacrifice of strength, tone or range!

Because of its high strength and excellent physical properties, foundries have been using Herculoy for years in the production of sand castings for many types of work.

Still another use has now been found for Herculoy. It is being used by the U. S. Coast Guard for the manufacture of bells for their service.

Hundreds of bells, ranging from 25 to 1,000 pounds, have been cast from Herculoy. Extensive and exacting tests were made and it was found that—

Herculoy has a carrying tone equal to regular bell metal.

Herculoy, due to its high strength, produces a much stronger bell.

Herculoy effects a saving in cost of metal and is readily available.

If your wartime production requires the use of non-ferrous metals of any specification, remember Federated. Your inquiry will receive prompt attention from the Federated office nearest you.

Write for FREE Folder H-6 describing Herculoy Bell Metal

INGOT METALS AND WHITE METAL ALLOYS PRODUCED BY FEDERATED

ALUMINUM
BRASS
BRONZE
DIE CAST ALLOYS
SOLDER
BABBITT
TYPE METAL
ZINC DUST

All of these in standard specifications. Special alloys to your order.

*Registered Trademark of Revere Copper and Brass Inc., under whose patent the alloy is manufactured.

FMD

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METALS DIVISION

AMERICAN SMELTING and REFINING COMPANY

120 BROADWAY, NEW YORK (5) N. Y.

Nation-wide service with offices in principal cities

FREEMAN DOWMETAL PATTERN PLATES..

Now Available

FROM STOCK!

FREEMAN
DOWMETAL

⅛" — ¼" — ½" — ⅝" — ¾" THICK ANY SIZE

ONE DAY DELIVERY . . . ORDER BY FLASK SIZE
IF SQUARE GIVE OVERALL SIZE

SEND for special Dowmetal Pattern Plate pamphlet showing sizes and prices. Made in any size or style and shipped the same day order is received. Must have priority and END USE. We are listing prices of a few of the thousand sizes we can furnish from stock.

WE ALLOW 1" FOR FLASK AND 2½" ON EACH END FOR PINS AND EARS

FLASK SIZE	THICKNESS 1/16"	THICKNESS 3/8"	THICKNESS 1/2"
10 x 12	$4.10	$4.90	$ 6.55
11 x 14	4.90	5.90	7.85
12 x 14	5.30	6.35	8.45
12 x 18	6.30	7.55	10.10
13 x 14	5.65	6.80	9.10
13 x 17	6.50	7.80	10.35
14 x 14	6.05	7.25	9.65
14 x 20	7.80	9.35	12.45
15 x 15	6.75	8.10	10.80

FLASK SIZE	THICKNESS 3/8"	THICKNESS 1/2"	THICKNESS 5/8"
16 x 16	$ 8.95	$11.95	$15.00
17 x 17	9.85	13.15	16.50
18 x 18	10.80	14.40	18.00
20 x 20	12.85	17.10	21.50
22 x 22	15.00	20.00	25.00
24 x 24	17.50	23.25	30.00
26 x 26	20.00	26.50	33.50
28 x 28	22.75	30.25	38.00
30 x 40	32.50	43.25	55.00

We must have priority

The Freeman Supply Company

Pattern Shop & Foundry Supplies & Equipment

Mahogany and Pine Pattern Lumber

1152 East Broadway **TOLEDO 5, OHIO** **Tel. TAylor 4624**

Government Moves To Aid in Contract Termination and Reconversion

WHILE the foundry industry struggles to overcome handicaps hampering production of castings for war, other problems are developing which require study and action. End of the war in Europe will bring a wave of contract cutbacks and cancellations which will influence most foundries. The Army has indicated a desire to settle claims as quickly as possible, and a uniform termination procedure has been developed to facilitate such action. In many of the termination cases handled thus far, much time has been consumed by the contractor in preparing the claims. Therefore, if foundrymen will begin now to get records and other data in excellent shape, handling of termination claims will be speeded greatly. The Army also suggests the advisability of appointing an important executive of the company to handle the termination job.

Reconversion will follow termination of war production. On first thought the problems of converting a foundry to civilian production appear rather simple. With orders for castings, with the necessary patterns and rigging, castings can be moving off the shipping platform in a very short time. Reports indicate some foundries are in the fortunate position of having orders and patterns on hand to start production as soon as the demands of war begin to taper off.

But in all probability, most foundries will not find the problem quite that simple. Sales organizations, depleted during the war years by assignment to production jobs, must be rebuilt, and the old customer contacts must be cultivated.

War production has caused considerable wear and tear to plant and equipment, and steps must be taken toward repair and replacement. To permit foundries and other industrial organizations to prepare now for postwar civilian goods production, the War Production Board recently issued a regulation which permits placement of unrated purchase orders for 15 specific types of capital equipment, including foundry equipment.

According to a study of postwar foundry plans conducted by THE FOUNDRY and presented in the June and July issues, approximately 61 per cent of all foundries plan to purchase new equipment to replace worn-out or obsolete machines or to improve foundry techniques. This is an exceptionally high total and indicates the determination of the industry to continue its march of progress when peace comes again.

The new WPB order permits industry to get in line now for the procurement of foundry equipment when war demands ease.

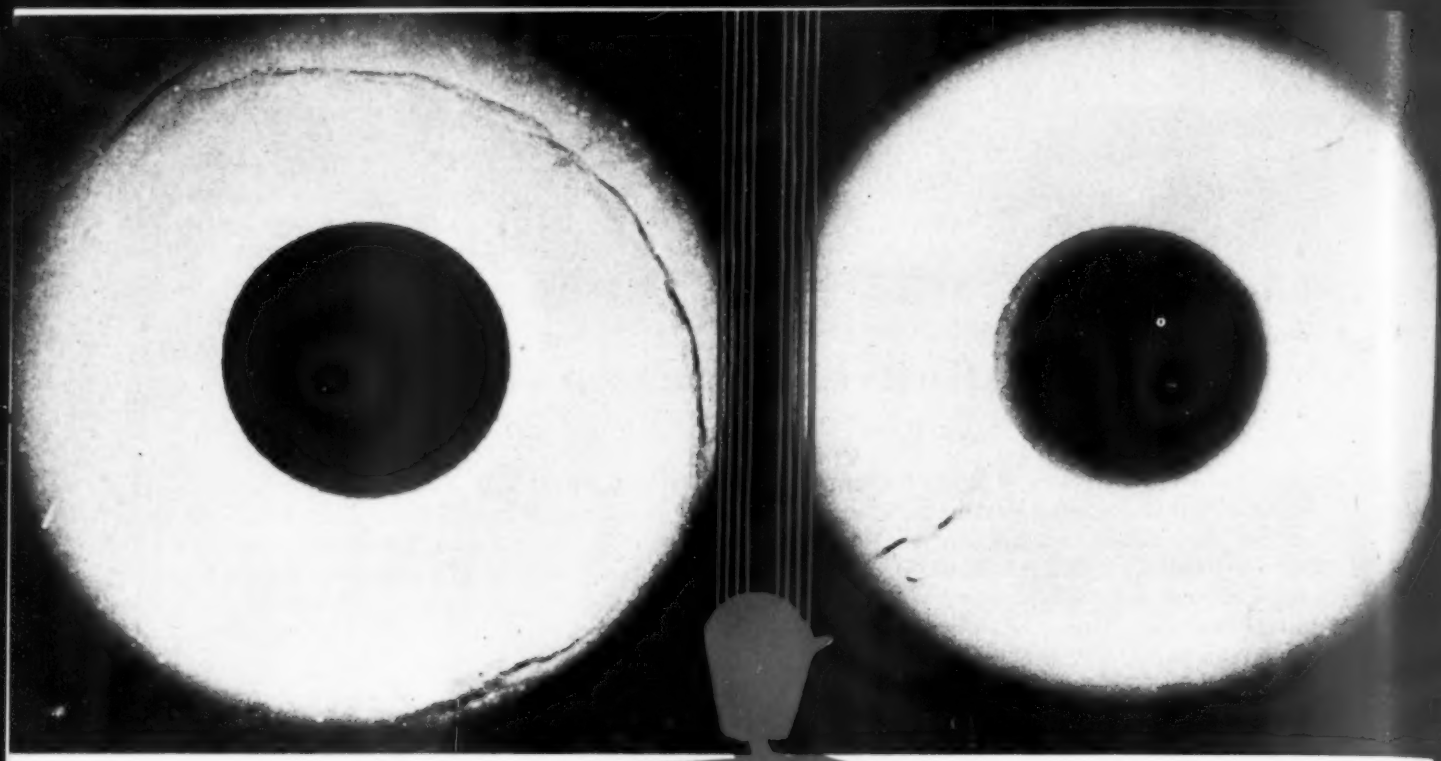
How To Lose a War

MANPOWER continues the most pressing problem of the foundry industry. While some of the tumult and shouting of government agencies gradually is dying, too little progress has been made in handling basic factors contributing to the present situation, many of which have been outlined by industry on several occasions. In recent months the foundry industry has been the victim of an attack by powerful labor forces, aided and abetted by a labor government in Washington. The Department of Labor and certain labor committees of several war agencies have been responsible for much of the unfavorable publicity on foundry working conditions which flooded the country some weeks ago. Recently objections of unions appear to have caused the War Manpower Commission to withdraw certification for the use of German prisoners of war to overcome manpower shortages in foundries.

Although there has been a serious shortage of castings for trucks, resulting in part from the doubling of the truck program, the foundry industry has been the innocent bystander in the battle between Donald Nelson of the WPB and General Somervell of the Army over resumption of civilian production on a restricted scale. Being held up as an industry which is behind on its war schedules has not helped in the production of essential castings.

Most difficulties in production of castings result from rules, regulations and actions promulgated at Washington. While production will increase in the months immediately ahead, the situation cannot be cured until some of these regulations are changed sufficiently to give foundrymen a helping hand in the matter of manpower, and until the War Manpower Commission decides that providing men to produce castings for war is more important than kowtowing to the dictates of pressure groups. If prisoners of war are available and can do a job in the foundry, they most certainly should be used in this emergency.

Frank G. Steinebach
Editor



By CLYDE B. JENNI
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Stopper Heads X-Rayed to Eliminate POURING TROUBLE

POURING practice is an important phase of steel foundry operations. Regardless of the steelmaking processes used, the metal usually is tapped into a container, called a ladle, and poured into molds. As furnace capacities and steel practices differ among plants, so also is there a difference in the types of ladles and size of ladles used.

All steel foundries using the open-hearth process, either acid or basic, and others pouring sizable castings, use the bottom-pour ladle. This ladle is a refractory-lined steel shell with a hole in the bottom close to the rim in which is inserted a refractory nozzle, usually made of clay. A stopper made of a graphite-clay mixture, mounted on the end of a steel rod protected by clay sleeves, fits into the nozzle. The stopper-rod assembly extending vertically through the metal in the ladle is fastened to a goose-neck which in turn is connected to a lever system. Thus the flow of metal is controlled by raising and lowering the stopper in and out of the nozzle.

Refractory properties of both nozzles and stoppers are of great importance to the successful handling of molten steel. These parts must function properly throughout the pouring period, giving clean shut-offs and opening easily. These requirements are severe, especially in cases where many castings are poured from one heat. For example, frequently there are 150 ladle openings in an 80-ton heat. A heat of this size requires about 1 hour and 30 minutes to pour. This means that the refractory parts are subjected

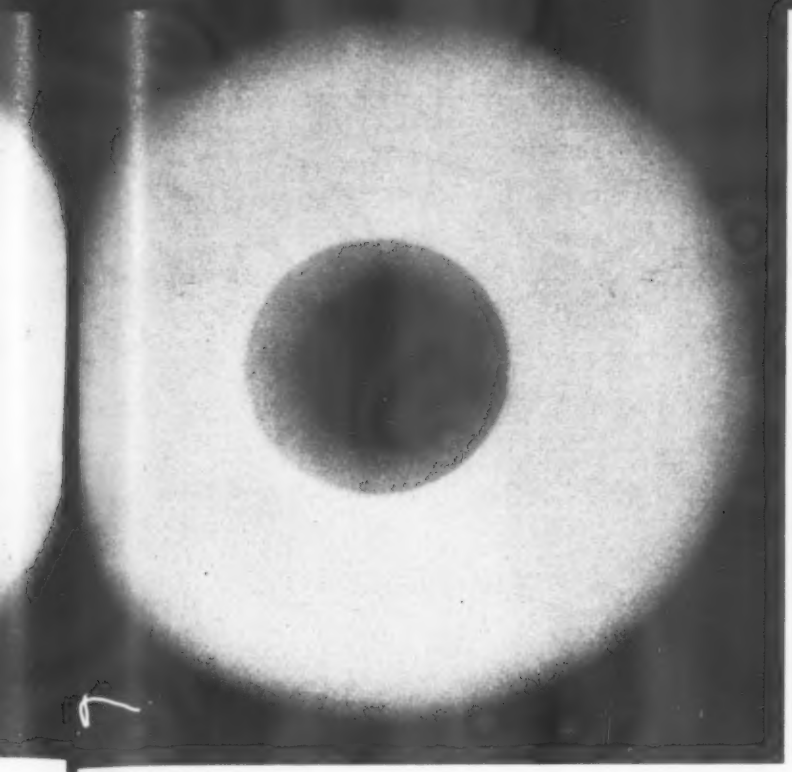

Fig. 1—(Left)—Exograph showing circumferential discontinuity in stopper head

Fig. 2—(Center)—Radial discontinuity may occur in stopper head

Fig. 3—(Right)—Exograph of sound stopper head

to the high temperature, erosion of flowing molten steel under a ferrostatic head, and repeated openings and closings.

Choice of the proper degree of refractoriness of the nozzle and the stopper head is delicate and important. If the nozzle is sufficiently hard and refractory to withstand the erosion of the steel, the stopper head may not seat easily. A leak started in a hard refractory material is very difficult to stop, and usually the leak tends to get worse. The seat of the nozzle must be soft enough to permit the stopper head to be pressed into it, otherwise there will be a tendency to leak. The nozzle, on the other hand, cannot be too soft or a leaker will result from the erosion of the molten steel.

Possess Proper Refractory Characteristics

Manufacturers of both nozzles and stopper heads have, through research and experience, gained sufficient knowledge to produce materials of the proper refractory characteristics. Sufficient knowledge also is available to recommend proper designs to accommodate varying operating conditions. The chief concern of manufacturers of these materials is the control of their processes so that consistency of product is achieved from lot to lot. This of course means rigid operating controls and adequate inspection standards.

Difficulties encountered while pouring are not only troublesome but also hazardous. If serious difficulty is encountered, an entire heat of steel may be lost. In such an accident, suitable pig bed space or facilities for taking the molten metal may not be available and the foundry is hard pressed to dispose of the rapidly escaping steel. Loss of metal under present conditions is an economic crime since disrupted production schedules, lost time and lost metal cannot be reclaimed.

Running or leaky stoppers are a menace to equipment and personnel alike. Even though workmen handling a heat wear protective clothing, there is a danger of being burned by metal spilled while such a ladle is carried through the shop. Expensive patterns and other equipment may be damaged or destroyed in a like manner. A further result of pouring steel with a leaky stopper is the spilling of metal over the floor and molds resulting in very poor working conditions until the "mess" can be cleaned up.

Molds which are poured with a leaky stopper obviously are not poured in the proper manner. The metal from the running stopper strikes the sides of the pouring gate or mold while the ladle is being "spotted" over the pouring cup, causing sand erosion and subsequent entrapment. The flow of metal during pouring cannot be controlled closely and the molds are not filled in the manner prescribed by the foundry foreman. Defects such as scabs, cold-shuts, and splashes are encountered frequently as a result of the faulty pouring technique.

In addition to the previously mentioned results of a leaky stopper, consideration also should be given to the hard work and anguish of ladleman and pouring supervisor in trying to manipulate the lever so as stop the leak. This endeavor on the part of the workmen is of importance for if an apparently harmless dribble is not controlled, severe erosion may result and the "leaker" may progress to a point where it cannot be controlled and the heat may be lost.

There are several factors which must be controlled to insure the successful handling and pouring of molten steel. All mechanical equipment of the ladle must be in proper working order. Wearing parts should be inspected frequently by competent maintenance workmen. The nozzle must be placed properly in the ladle. The stopper rod and head must be assembled carefully and dried properly. Sufficient allowance must be given for expansion when assembling the stopper rod. This is accomplished by tightening a nut on the end of the stopper rod until the refractory sleeves are tight; the nut "backed off" approximately 1/16-inch per foot of sleeve length, thus allowing for the expansion which will result when the rod is subjected to the temperature of the molten steel.

Setting of the stopper-rod assembly must be accurate. Allowance must be made for the ferrostatic swirling action of molten metal flowing through a funnel-like orifice. The stopper head should be ground to fit the contour of the nozzle with which it is mated. A test with sand to insure complete tightness should be made before a prepared ladle is used. Sufficient metal must be poured on the first opening of the ladle to allow the refractory nozzle and stopper head to become slightly softened. If this precaution is not taken a leaky stopper is quite likely to result.

As a result of an unusually severe period of ladle trouble, leaky stoppers, etc. in our plant, the matter of a more rigid inspection of stopper heads was investigated. Several heads were sectioned and the presence of serious voids was disclosed. In some (*Please turn to page* 208)

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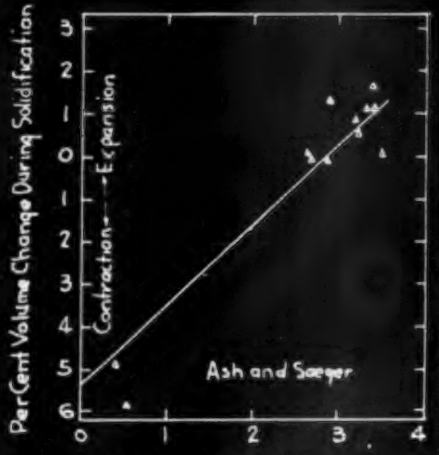

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The second of three parts from the Howe Memorial Lecture presented at the New York meeting of the American Institute of Mining and Metallurgical Engineers.

ASSUME two sizes of bars connected at both ends as in the familiar strain lattice of the Germans (Fig. 6). The small bars first freeze and expand. Now the small bar begins to contract but the large bar begins to expand, so that tensile stresses are set up in the small bar and compressive stresses in the large one. The relative strength and plasticity of the two will determine what happens. But this is an exact analogy to the performance of both iron and steel at the pearlite transformation point, so that it is not necessary to go into the many things that can happen. Fig. 7 shows the relation of volume change during solidification to the graphite content.

Another erroneous idea in connection with this expansion on freezing has been current in the literature for a long time. That is the idea that, as Professor Howe expressed it: "the generation of graphite is useful in the process because, occurring as it does during and immediately after solidification, it causes a sudden expansion, which both lessens the tendency of the castings to tear themselves into pieces during solidification and causes them to reproduce more accurately the shape of the pattern." As we have just seen, the first "advantage" is fully realized only in uniform sections (which the designers seem to avoid whenever possible) but the ability to reproduce the shape of the pattern is solely a function of the fluidity of the metal, giving the word the foundryman's definition, not the physicist's. This may be mathematically expressed thus:

$$\text{Fluidity} = K\frac{T - FP}{FP - MT}$$

in which T = temperature of the metal; FP = freezing point of the metal; MT = temperature of the mold, and K = a coefficient depending on the true fluidity, surface tension, mold friction, mold atmosphere, and the chemistry of the metal at that temperature in that atmosphere, etc.

It is obvious, since graphite does not begin to form until a considerable part of the metal has frozen, that the fluidity is, at that time, for all practical purposes, zero. The only exception might be a rigid mold, where there might be sufficient resistance to force the plastic metal into spaces it might not have sufficient fluidity to enter during the casting. The idea probably started from the exquisite detail of the cast-iron art ware of the first half of the nineteenth century, but having the misfortune of breaking one of those pieces awhile back, it was some secret satisfaction to find it white! Fig. 11 shows a pattern cast with steel and gray iron. Although the steel was not quite fluid enough to fill out one of the points, the detail of the other points is as sharp as the gray iron; in fact, the fins are quite a little more pronounced on the steel.

Now, let us consider the effect of the graphite on the mechanical properties of gray cast iron. For more than a hundred years mathematicians and testing engineers have been interested in the performance of gray cast iron and especially in the discrepancy between bending strength as measured and that calculated from the tensile

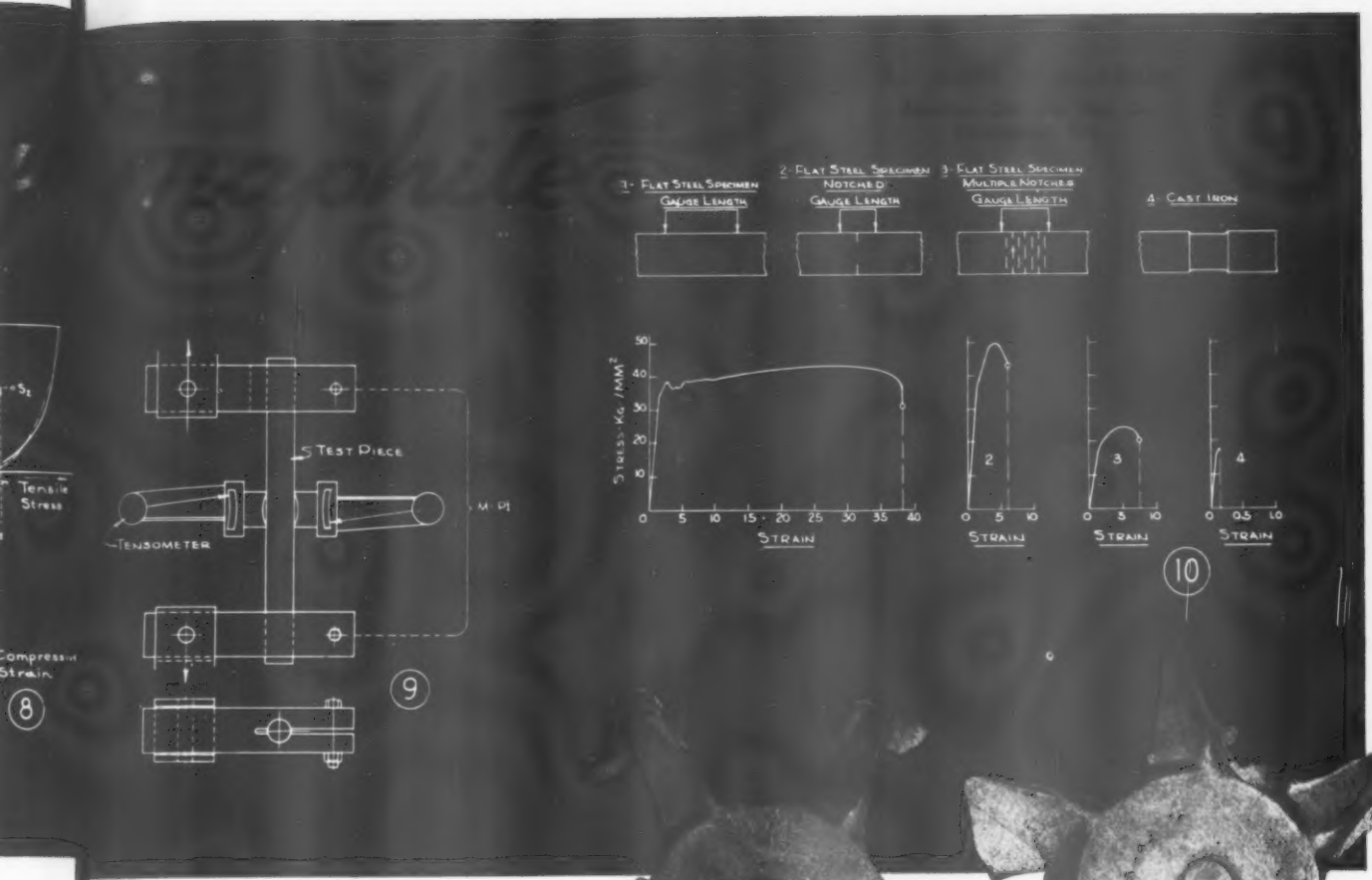


Fig. 6—Strain lattice. Fig. 7—Relations between volume change during solidification of some cast irons and graphitic carbon content. Fig. 8—Bach's stress-strain diagram. Fig. 9—Thum's device for measuring actual stress in bending test. Fig. 10—Thum's experiment. Fig. 11—Same casting in steel and gray iron

strength by the conventional beam formulas. Tredgold, in 1823, seems to have been the first to make an extensive investigation of the strength of cast-iron beams and his calculations were recognized to give results differing from tensile strength by Hodgkinson, the editor of the fourth edition of Tredgold's book, *The Strength of Cast Iron* (1842). Hodgkinson stated that this "arises principally from the supposition that the neutral line remains stationary during the flexure of the body."

The concept of the shifting of the neutral axis was used by St. Venant to reconcile the results of observations with the theory of elasticity in 1864 and beginning in 1888 Bach wrote a series of papers, later incorporated in his *Elastizitat und Festigkeit*, the first edition of which was published in 1889, in which some experimental and theoretical results were reconciled within 3 per cent. His calculations showed a displacement of the neutral axis, for this particular beam, of 8 per cent toward the compression side—that is to say that there was 38 per cent more metal in tension than in compression at the instant of fracture. Bach's curves (from the ninth edition of his book, Fig. 5, page 301) are shown in Fig. 8.

W. J. Schlick and B. A. Moore made a study of this in *Bulletin* 127 of the Iowa Engineering Experiment Station, in 1936, in the course of a study on combined bending and tension, which is the foundation of the modern design of cast-iron pipe. Their method of analysis was essentially the same as that of Bach and consists in plotting the stress-strain curves for both tension and compression as in Fig. 8; locating the center of gravity of the tension side, then determining the area on the compression side, which, multiplied by the distance from the center line to its center of gravity, gives an amount equal to the same product on the tension side. Then the difference between the distances of the tension and compression centers from the center line gives the displacement of the neutral axis. About the only use for the equations for stress strain is in this calculation and the calculation of resilience, the term applied to the area under the stress-strain curve of nonductile materials. Still, there is somewhat of a fasci-

nation about them to anyone interested in the behavior of the material.

Three general equations have been suggested for cast iron, in all of which P indicates load (or stress); f, the strain, and c, a, b, q and n are constants of the particular material and conditions of loading. P_B is load (stress) at failure.

Bach used the parabola $f = CP^n$, which he ascribes to Buelffinger in 1729 and which later was rediscovered by Hodgkinson. Gruebler in 1900 proposed a hyperbolic equation $P = f(a - bP)$, which has since been used by several investigators. It fits the actual curve much better than the parabola. Meyersberg, in 1931, proposed the equation $P = Cf^n + q \sin 2\pi \frac{P}{P_B}$ which is the Bach parabola with a positive correction for the curvature of the lower half of the curve and a negative correction for the upper half.

The parabola and hyperbola, determined by least squares, fit the actual curves very well until near the breaking point, where the deflection becomes increasingly greater than the load. The Meyersberg formula uses only the simultaneous equations for half load and breaking point (where the sin = o) for the first term, hence is exact at these points; the second term is then easily obtained from the difference between the first term and the data at the quarter and three-quarter points where the sin is $+1$ and -1, respectively.

Thum, of Darmstadt, became interested in why cast iron behaved as it did and made the simple experiment shown in Fig. 10. Naturally it would be most difficult to duplicate the pattern of graphite by any such means, but the change from the characteristic ductility shown in the first figure by the usual steel specimen is very good evidence that, in tension, the graphite acts as voids.

Thum was interested in the error of the usual beam calculations when applied to the rotating beam commonly used for the determination of the endurance limit. He therefore made some studies using the device shown in Fig. 9. This gave actual strain on both sides of the beam, which was converted to tensile or compressive stress by previous readings on bars of the same iron, same size, tested in direct tension and compression. His results for two quite different irons are plotted in Fig. 12. The endurance limits for the two irons were respectively 7 and 12 kg. per sq. mm. as conventionally calculated, so from the curves we obtain as correction factors:

$$\frac{6.3}{7} = 0.90 \quad \text{and} \quad \frac{11}{12} = 0.92$$

Considering the normal scatter of values obtained in endurance testing, these are not serious corrections, but if cast iron is to be used under dynamic tension and compression it should be remembered that such a factor is needed. In reversed bending, the factor does not apply, since the stress and strength calculations are mutually corrective.

Many investigators since Tredgold's time have studied the effect of the shape of the beam on the calculated strength. Thum, using the device shown above, determined the actual stress for the shapes shown in Fig. 13 and compared it with the modulus of rupture. This is undoubtedly the best set of tests available and shows clearly the departure from the assumptions of the elastic theory; viz., homogeneity, isotropy, and elasticity. The shapes vary progressively in the way the metal is distributed about the center line and the departure from theoretical increases as the distance from the center line to the center of gravity of the half sections decreases. The difference in the performance of the strong, low-graphite No. 3 iron and the soft, high-graphite No. 5 is very small on the I-beam but quite noticeable on the other shapes. Bach's tests in the 1880's give substantially the same relations and many thousands of tests on round and square or rectangular bars have corroborated the results on shapes 2 and 3 of Thum's work.

Fig. 12—Calculated and actual stress in outer fibers in bending test. *Fig. 13—Table showing effect of shape on bending strength*

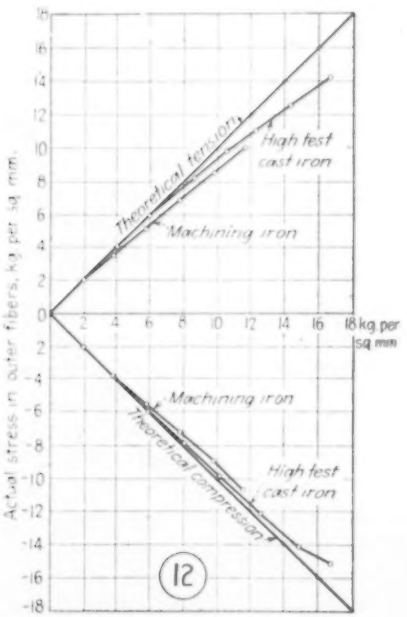
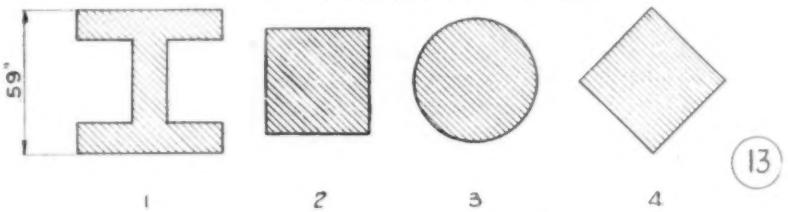


FIG 21 EFFECT OF SHAPE ON BENDING STRENGTH



ACTUAL STRESS KG/MM²

MATERIAL	5				3			
SHAPE	1	2	3	4	1	2	3	4
THEORETICAL								
4	4.0	3.8	4.0	3.6	3.9	3.9	3.9	4.0
8	7.3	7.0	7.0	6.6	7.6	7.4	7.5	7.5
12	10.1	9.8	9.4	9.2	11.0	10.7	10.7	10.4
16					14.2	13.8	13.8	13.3
Actual Bending Stress	19.2	19.5	18.6	20.2	29.5	28.8	29.8	29.0
Modulus of Rupture (Conventional)	31.4	35.3	37.1	48.4	47.5	49.7	55.5	64.0
Ratio $\frac{MB}{S}$	1.64	1.81	2.00	2.40	1.61	1.72	1.86	2.21
Displacement of the Neutral Axis in % of the depth.	3.8	3.3	2.6	2.3	3.5	1.9	1.5	1.6

Foundry Metallurgy of DIE CASTING

By JAMES L. ERICKSON
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PRIME prerequisite to satisfactory and efficient manufacturing of die castings, or what are today commonly called pressure die castings, is a foundry practice whose scope encompasses not only the chemical control of the virgin metal from the time it enters the plant to the time it leaves as finished die castings, but one which also takes into account the actual physical metallurgy of the die casting process itself.

It will be conceded by those engaged in the manufacture of die castings that, as yet, the industry is rather an art than a science, and depends to too large an extent upon personal experience of die designers, die makers, and die casters and not enough on the recognized metallurgy of the process. No definite rules and procedures have been established by the industry as a whole and no large scale co-ordination program has ever been inaugurated.

Until such time as a large body of tested data is assembled which can be used to indicate proper methods of manufacture of die castings, the industry will remain an art rather than a science. Today agreement is found among both large and small companies engaged in the manufacture of die castings on at least one point, namely that the overall results of any particular run, using any single die, on any single machine, are unpredictable with any accuracy.

It is unfortunate that a greater consistency of quality is unattainable. Mere transferring of a die from one machine to another results many times in a wide variation of quality of product, although supposedly none of the myriad variables have been intentionally altered, save that of the machine transfer itself. In many cases merely changing the shift, from day to swing, or from swing to grave, with its change of operator, causes serious and undesirable reduction in the quality of the product. Operator number one may be running on a 10 per cent rejection schedule, and his successor on the succeeding shift will produce a run with a 25 per cent rejection rate!

Just what does one operator do that another operator does not? What is there about one machine which makes for a successful operation of one die and not another? Why will two die casting machines consistently produce different results with the same die? Why will one manufacturer be able to turn out a certain die casting with a 5 per cent rejection whereas another die casting company using the very same die will turn out die castings that do not pass the first inspection although the second company is using the first company's formula?

The answer to these questions as well as to any questions which ask why there is *variance* of operations is a simple one.

When the statement is made that one die was run on one machine with only a 10 per cent rejection and then run later on another machine with a 25 per cent rejection and that each time its operating conditions were identical, the phrase *identical conditions* is overly vague. Are we to call two temperatures which differ by 100, 50, 25, 10, 5, or 1 degrees Fahr. the same? Where are we to draw the line? When are temperatures *identical?* When might we be allowed to say *the conditions were identical* and have it mean something? Likewise for pressure variations, are we to say that 1000, 100 or 1 pound per square inch is to mark the dividing line between *similar pressures* and *dissimilar pressures?* Too long it has been standard practice to consider *conditions* identical when in reality there can be no justification for this. When two temperatures differ by 10 degrees they are *not* the same. Differences of 100 pounds per square inch may mean the difference between a porous and nonporous casting; so why then should we accept the statement that conditions were identical when really they are not? We must decide on what we mean by *similar* and *identical* operating conditions. Perhaps a closer scrutiny of our present careless use of the phrase *identical operating conditions* will show us that the reason we get different results on different machines results from *dissimilar* conditions.

Die casters on the whole also tend to speak of the various controlling factors without an adequate understanding and knowledge of what these controlling factors actually are or even how to control them. Surely it is known that the die temperature, metal temperature, pressure used, original chemical analysis, and gating design are such factors. However there are further factors which ordinarily are not perceived. The author wishes to suggest the following as such factors:

1. Presence of small amounts of certain impurities in the alloy.
2. Presence of dissolved gases in the alloy.
3. Fluxes and degassers used.
4. Speed of melting.
5. Temperature and time of retention of the metal in the liquid state before using.
6. Rate of pour into the injection chamber if a cold shot machine is used.
7. Temperature of injection chamber.
8. Speed of the injection plunger piston.
9. Die lubrication.
10. Type of venting employed.
11. Type and placement of overflows.
12. Type of die finish.

Of these influencing factors, (*Please turn to page* 192)

By R. A. GEZELIUS

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Water Quenching Large Steel Castings

Large castings as well as smaller ones are being water quenched successfully. Equipment employed in some plants for handling castings in this process is semi-automatic in its operation. This is the fifth of a series of articles on the subject, comprising a paper presented before the Steel Founders' Society of America

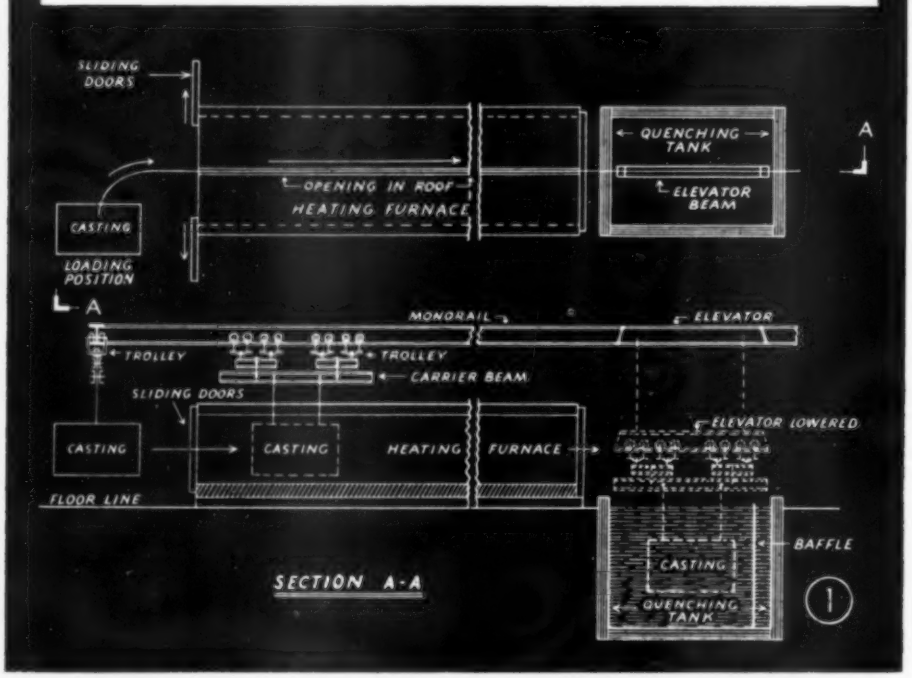


Fig. 1—Schematic drawing of a continuous heat treating furnace used by the General Steel Castings Corp. through which the castings are carried on a monorail conveyor

LIQUID quenching of large steel castings has not been common practice until the past few years. This has probably been due to two factors: (1) the popular opinion among consumers that liquid quenching of castings is a dangerous practice which will not produce satisfactory results, and (2) the common viewpoint that parts with varying thicknesses must be oil quenched. The latter viewpoint retarded the use of liquid quenching on large castings for economical reasons. The capital expenditures required for the oil supply and the circulation and cooling systems which would be required to prevent fires were not warranted for the few castings which might be produced.

Experience gained the past few years has proved that satisfactory results can be obtained by liquid quenching and that properly controlled water quenching can be employed on large steel castings.

Demand for liquid-quenched castings has increased rapidly in recent years. The sizes of castings requiring this treatment also have increased and it was thus possible for producers to acquire the experience and equipment necessary for treating the larger castings. As water quenching was found satisfactory for some of the smaller castings, this practice also was employed on the larger castings.

Produced in Quantity

Most of the castings which have been liquid quenched in the past few years have been produced in quantity. Specification restrictions have been such that a uniform product has been essential. In order to insure this uniformity of product with the manpower available, it has been necessary to rely almost entirely upon automatic controllers or automatic recorders of the quenching practice.

Factors which must be controlled and repeated time after time in as nearly the same manner as possible are:

1. Temperature of the casting as quenched.
2. Severity of the quench: (a) water temperature, (b) water circulation.
3. Time of immersion in the water.
4. Temperature and time of tempering after quenching.

The sizes of the castings made individual handling desirable in many

cases. The equipment and processes described permit individual handling and yet assure comparable heat treatment of each casting of the same design.

Two semi-continuous, gas-fired furnaces, 73 feet long and 8 x 5 feet in cross-section, are employed for the heating prior to quench and for the tempering of castings up to 6500 pounds in weight.

These furnaces are divided into five zones. The first zone contains two castings. This zone has no burners, the castings being heated only by the waste heat from the hotter zones ahead of them. The second and third zones, which also contain two castings, are heating zones in which the castings slowly are brought up to temperature. The fourth zone is at the quenching temperature and provides a portion of the "soaking period" required. This zone also contains two castings. The last zone contains only one casting and is used to adjust any slight variations in temperature which may occur in the fourth zone.

Fuel Premixed

Fuel for these units is propane mixed with a predetermined amount of air in a special mixing unit. This explosive mixture is piped to "radiant heat" burners distributed along the furnace wall. The amount of gas distributed to the burners in each zone is controlled by an automatic flow valve which, in turn, is controlled by a controlling-recording potentiometer. With such a premixed gas the gas-air ratio is the same, whether the burners are being used at their maximum or minimum capacity.

Castings are carried through this furnace on hangers suspended from monorail conveyors. After the furnaces are filled, and up to tempera-

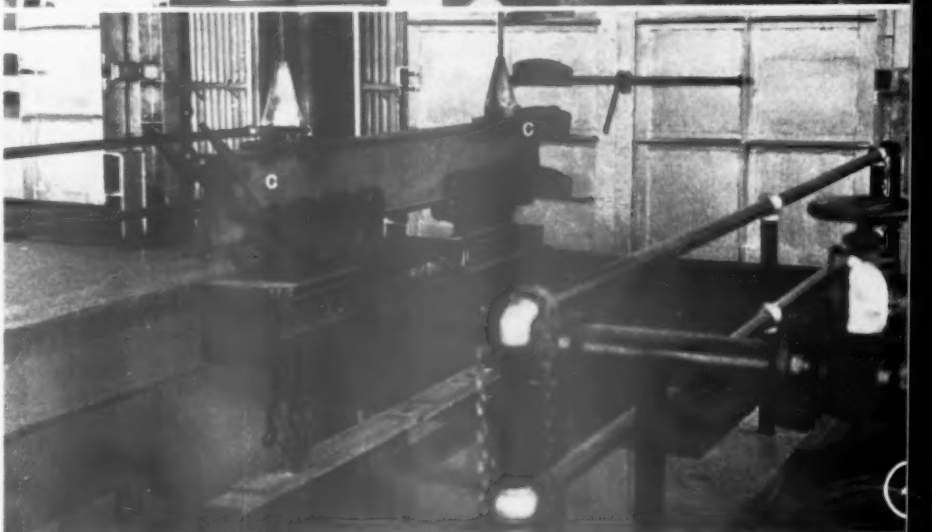


Fig. 2—Entrance end of the heat treating furnace. Hydraulic elevator (B) raises castings to monorail carriers (A)

Fig. 3—Monorail conveyor carries casting over quench tank. Restraining lugs (C) trip switch (D) which causes beam to lower the castings

Fig. 4—Mechanism in position during the quenching operation

Fig. 5—Control panel, timing and recording equipment used in quenching operation

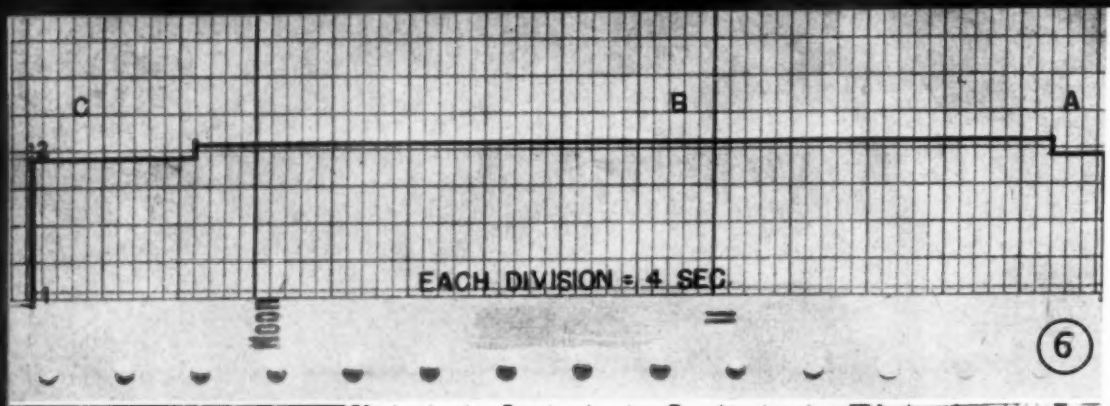


Fig. 6—Time recorder chart shows: (A) time required to pull casting from furnace; (B) quenching time; (C) time required to place casting in tempering furnace

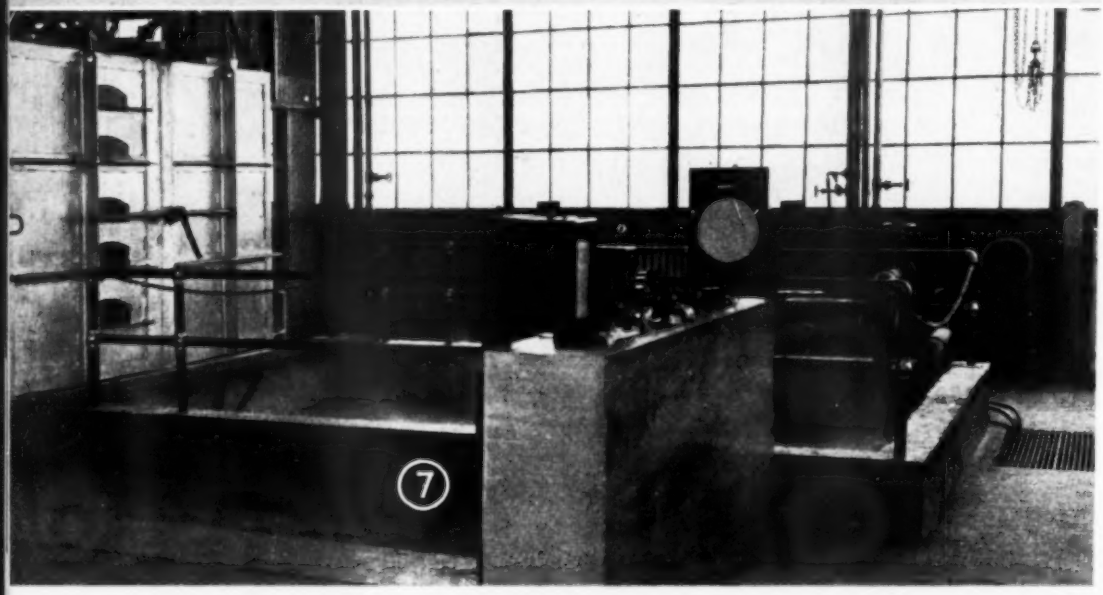
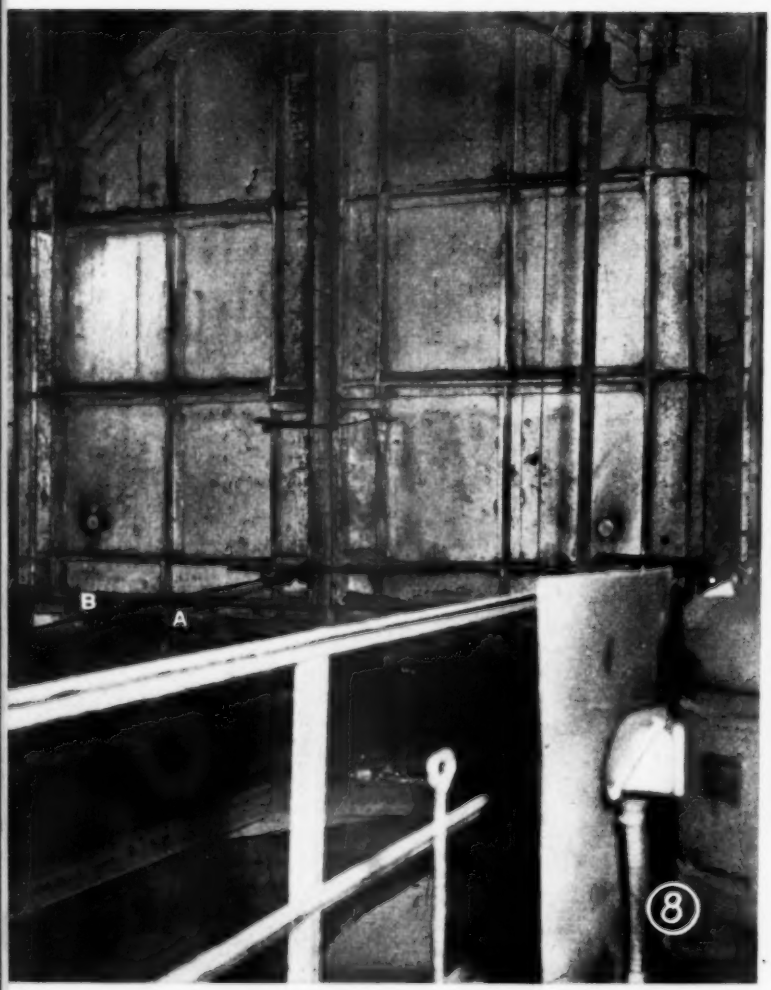


Fig. 7—General view of quenching end of continuous furnace

Fig. 8—Quenching end of batch-type furnace. (A) is one end of skid projecting under furnace door; (B) is cable for pulling skid onto roller conveyor

Fig. 9—Quench tank with block and tackle at (A), quenching tank at (B) and control house at (C)



ture, a casting is removed for quenching on a uniform time cycle which is adjusted to give a proper "soaking period" for the maximum section being treated. After a casting has been removed for quenching, a cold casting is introduced at the other end of the furnace and the entire string of castings is moved forward one space. A schematic drawing of the furnace is shown in Fig. 1.

Fig. 2 illustrates the cold end of the furnace. The monorail from which the castings are suspended is shown at *A*. A small hydraulic elevator *B* is used to lift the castings in order that they may be hooked onto the monorail carriers.

Quenching is carried out on the section of monorail immediately above the quenching tank, as shown in Fig. 3. The casting is removed from the furnace by lugs on chain *A* driven by sprocket *B*. The motor driving this unit is manually controlled. The carrier is held on the short section of the monorail which is lowered by the restraining lugs *C*. As the carrier is pulled onto this section of the beam, the lugs on the chain engage the trip switch *D* which causes the beam to lower and automatically starts an electric timing device.

Fig. 4 illustrates the beam in the lowered position with the hangers immersed in water. The restraining lugs *C* mentioned previously are shown at the ends of the beam.

The control panel and the timing and recording equipment employed for the quenching operation are shown in Fig. 5. The electric timing device is shown at *A*. This clock can be set to control the time of immersion accurately in steps of 7.5 seconds for any time interval up to 15 minutes. After the prescribed time has elapsed, the casting is removed automatically from the water.

Maintain Control and Records

Manual switch B controls the motor which removes the casting from the furnace. The levers *C* control the air cylinders which open and close the sliding doors at this end of the quenching and the tempering furnaces. The lever *D* may be used to control the quenching operation manually. The time-recorder *E* keeps an accurate record of the elapsed time between the moment the doors of the quenching furnace start to open, the time the casting lowers into the water, the time the casting leaves the water and the time the doors of the tempering furnace are opened. The temperature-recorder *F* keeps a continuous record of the water temperature. Each quenching operation is started at a water temperature of 100 degrees plus 5 degrees. No attempt is made to maintain this temperature during the quenching operation.

Sufficient water and circulation are provided to prevent large changes in the water temperature. The tank for this furnace holds 10,000 gallons, and two pumps circulate 2500 gallons of water per minute. With this amount of water and circulation, a 6500-pound casting will be quenched in water which varies from 100 degrees to 125 degrees Fahr. After each quenching operation, the water in the tank is brought to a temperature of 100 degrees plus 5 degrees by the addition of cold water.

A copy of a chart obtained on the time recorder is shown in Fig. 6. Each division on this chart represents 4 seconds. Section A shows the time required to pull the casting out of the furnace and start the lowering operation, in this case 14 seconds. Section "B" records the time of the actual quenching operation, 3¾ minutes. Section "C" shows the time required to place the casting in the tempering furnace, 43 seconds.

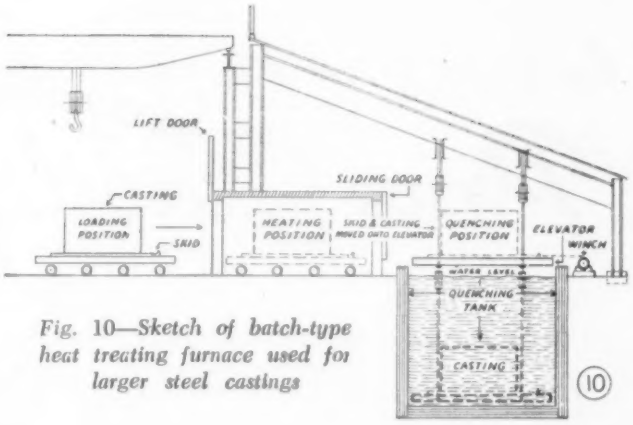


Fig. 10—Sketch of batch-type heat treating furnace used for larger steel castings

The tempering furnace of this unit is similar to that employed for heating for quenching. It also is divided into five zones, but the two first zones are used for the heating operation and the last three zones are maintained at the tempering temperature.

A similar, larger unit is used for larger castings with overall dimensions of approximately 16½ x 8½ x 2½ feet and a weight of approximately 11,000 pounds. Principal difference between this unit and that just described is the manner in which the castings are carried through the furnace. In the latter case, the castings are placed on a rack which is supported and carried through the furnace on alloy iron rollers on the furnace floor.

Quenching is carried out by pulling the rack and casting onto a suspended roller conveyor which is then lowered into the water. This operation in this case takes approximately 25 seconds from the time the doors of the furnace are opened until the casting is lowered into the water.

The controlling-recording potentiometers, timing device, and time and temperature recorders are identical to those employed on the smaller unit.

Satisfactory results obtained on the castings of this size resulted in the consideration of two overall dimensions of approximately 21½ x 10 x 5½ feet and weighed about 21,000 pounds. The second was approximately 16 x 12 x 8¾ feet and weighed about 85,000 pounds.

Size and weight of these castings and the comparatively slow rate at which they would be produced indicated that a batch furnace might be preferred. Fig. 10 is a schematic sketch of the equipment which was installed. The furnace is a car-type, gas-fired, pyrometrically controlled unit 34 x 15 x 10 feet. The car varies from that usually used in that three water-cooled 5-inch pipes are built into the bottom of the car. A large skid rests upon these pipes, the skid being built up to support the casting during the heating and quenching operation.

The casting is loaded onto the skid and car in front of the furnace. The car then is pulled into the furnace for the heating operation. (*Please turn to page* 176)

Gray Iron and Price Stabilization

Advisory committee member tells Chicago conference of Gray Iron Founders' Society that immediate changes in OPA policy are necessary

By C. B. MAGRATH
President
Greenlee Foundry Co., Chicago
Member Industry Advisory Committee of OPA

ONE of the difficulties in discussing the gray iron industry as a whole is that it is divided up into several groups, which use rather different manufacturing and sales methods. A grouping frequently is as follows:

(A)—*Mechanized foundries:* These generally are the larger units of the industry and their products are restricted to large numbers of castings from the same pattern.

(B)—*Production shops:* These may or may not be partially mechanized but specialize on relatively long runs of light castings.

(C)—*The "short run" or typical jobbing foundry:* These represent by far the larger number of units of the industry, although the average size is much smaller than the first group and generally smaller than the second.

(D)—*Specialty shops:* Includes plants making piston rings, etc., are small in number, but the value of their product is high.

These four different classes of foundries have quite different characteristics.

One important difference is that some foundries make castings for consumers goods—such as automobiles, refrigerators and washing machines. The mechanized shops as well as the production foundries generally produce the bulk of this business, whereas the jobbing foundries—particularly those making heavy castings—sell their products to the producers goods industries (machinery of all kinds) goods which are purchased by funds arising from capital investment.

This may seem like an academic distinction but it is not. Investment in new private enterprises in the 1930's was at a low ebb, and as a result a large number of the members of our industry started the war years in none too good condition either as to equipment or finances. These are the people who are being hurt if restricted to inadequate profits, and naturally their part in the war effort must also suffer.

The second difficulty in dealing with a government agency about problems of our industry is our woeful lack of statistics. A copy of the Statement of Considerations involved in the issuance of Maximum Price Regulation No. 244, Gray Iron Castings, was mailed by OPA to all members of the industry—at least so I understand. If you read this over you may not have liked the statements set out, and I can assure you that our committee repeatedly has criticized some of the figures in that statement. However, I am convinced that if the data set out is not representative of our industry the fault is not with the OPA but with the unwillingness to give statistics that seems to prevail in our industry. Nobody likes to be filling out statistical forms, especially when our office staffs are depleted, but I am afraid that in this case it is unfortunate, to say the least.

For some reason or other, the Census Bureau has not bothered much until recently about our industry. The *Census of Manufactures,* Vol. 2, issued in 1940 shows for the first time gray iron and semisteel castings as a separate industry. Previously, gray iron castings have been lumped in with machine shop products or malleable castings. Yet this volume shows that in 1939, there were 1161 firms reporting a total value of products of $209,719,754 and employing 65,459 people. I may say that the office of the Gray Iron Founders' Society has signed cards from 1977 gray iron foundrymen, so that the industry is considerably larger than shown in this census report.

Price stabilization of gray iron castings is further complicated by the fact that we belong to the group known as "tailor made" industries. There is no standard product in our industry. We make castings to fill the specifications of our customers. Therefore, there can be no standard price or price level.

The steel founders make castings to cover almost as many different applications as our industry, but that industry, through its trade association, got out a very voluminous price list or series of price lists some years ago. This is called the "Comprehensive Report of Price Lists of Miscellaneous Steel Castings" and is a substantial volume. This would appear to make price control on steel castings much less hazardous than for our industry, but it took some years and a great deal of money to compile this comprehensive report, so this procedure was not available to OPA for gray iron castings.

I have heard it said that due to the diverse nature of the industry and difficulties of establishing price control regulations equitable to all members of the industry, our industry should be exempt from price stabilization—that competition and customer relationships would prevent prices from getting out of line. I cannot agree with any such idea, but I certainly do not agree with some of the policies of OPA in attempting to control our selling prices.

I think that the formulae methods of pricing that is set out in MPR 244, is the only practical scheme that could be applied to our industry, in view of its "tailor made" character. By that regulation profits are limited, but they are limited only to the margin (*Please turn to page* 210)

cupola practice

Weight of fuel charges, proper coke bed height, zones in the cupola, and air supply are important factors in efficient cupola operations. This is the second and concluding article on the fundamentals of cupola practice. The first installment appeared in the August issue. The author is on loan from the International Nickel Co.

By DONALD J. REESE, *Chief*

Manufacture & Foundry Products Section
Metallurgical & Conservation Branch
Steel Division, WPB, Washington

THERE is a proper weight of fuel charge for every size cupola and a proper weight of metal charge for the size of the cupola and the type of iron being made in that cupola. A proper fuel charge—and by that is meant the intermediate coke charge—might well be based on 7.5 pounds of coke per square foot of cupola area. For example, a 48-inch inside diameter cupola has an area of 12.57 square feet and at 7.5 pounds of coke per square foot the fuel charge might well be 95 pounds. A 72-inch inside diameter cupola has an area of 28.3 square feet and a proper fuel charge might well be 210 pounds.

Actually, if such practical considerations as accurate weighing and the limitations of facilities to move raw materials from the yard to position in the cupola permitted, it would be preferable to use smaller fuel charges based on a unit of 5 pounds of coke per square foot of cupola area. However, under no conditions would one expect to keep within the limits of good cupola practice if this fuel unit exceeded 10 pounds of coke per square foot of cupola area. What we have is a fuel unit which has a great deal to do with the thermal efficiency of the cupola; that is, whether each pound of carbon will combine with oxygen of the air to generate 14,500 B.t.u. or whether each pound of carbon in combining with oxygen will generate only 4000 B.t.u. These are the respective heat releases for perfect combustion and incomplete combustion.

Operators of a number of cupolas, regardless of whether or not all furnaces are of one size, might check the areas and fuel charges and determine this fuel unit for each cupola. If the unit is one figure for one cupola and quite another figure for some other cupola it should be obvious this has some bearing on the different operations obtained on these cupolas.

Reference previously was made to a cupola lined to 72 inches, and it was stated that using a fuel unit of 7.5 pounds of coke per square foot of cupola area the coke charge might well be 210 pounds. At one time a certain foundry was operating three cupolas of this size, producing a different type of iron in each cupola. With one cupola the foundry used a 400-pound coke charge, with another 500 pounds and with the other 600 pounds. The iron charge in each case was 4000 pounds. Compared with my recommendation of a 7.5 pound coke unit per square foot of cupola area, this foundry's minimum unit was 19, the maximum was over 27 and the intermediate one was about 24. The performance from each cupola was different, and the cupola using 400-pound coke charges was regarded as the best. It was pointed out to the operators that they could not expect to duplicate performance in cupolas if they treated each one differently. Further, that the best performance might be improved considerably if they worked toward smaller fuel units per square foot of cupola area—at least to a unit of 10 but preferably to a smaller unit—but that all cupolas should use the same fuel unit.

In my many years of examining into the reasons for good or poor cupola practice the instances observed of outstandingly good cupola practice invariably have been accompanied by small fuel units, while mediocre cupola practice and large fuel units have gone hand-in-hand.

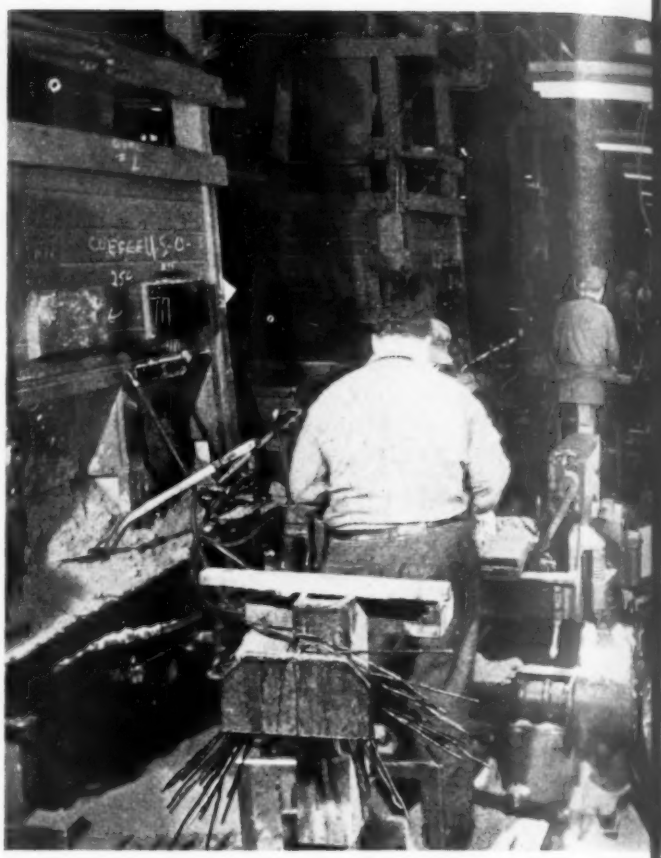
Not all of the coke which goes into the cupola in intermediate coke charges takes part in the chemical reaction with oxygen to generate heat, as some of the coke —and in some cases quite a bit of the coke—is dissolved in the iron. Most modern gray iron qualities are achieved by utilizing steel scrap as one of the components of the iron charge, and the intended result is to produce gray irons of 3.5, 3.25, 3.0, 2.75, or 2.5 per cent or less carbon in the product. The cupola is a carburizing furnace and it will always be found that the cupola charge contains less carbon than the cupola product for those irons of 3.5 carbon or less.

The difference between the amount of carbon in the product and the amount of carbon in the charge comes from the coke. For example, if it is desired to produce a low total carbon iron from the cupola of say 2.5 per cent, the ingoing cupola charge could not exceed 1.3 per cent and the amount of carbon absorbed in the melting process would not be less than 1.15 per cent. Since 1.15 per cent carbon is equivalent to 23 pounds of carbon per 2000 pounds of metal, if the coke contained 90 per cent carbon, 23 pounds of carbon would be equivalent to 25.6 pounds of coke.

The intermediate coke charge, when it is associated with the weight of the metal, may be referred to as the "apparent fuel ratio." After this coke charge has been credited with the amount of coke dissolved by the metal, the net quantity which unites with oxygen to generate heat may be termed the "actual fuel ratio."

Now if we agree that we (*Please turn to page* 202)

ALUMINUM CASTINGS by DODGE CHICAGO PLANT



By WILLIAM G. GUDE
Associate Editor
THE FOUNDRY

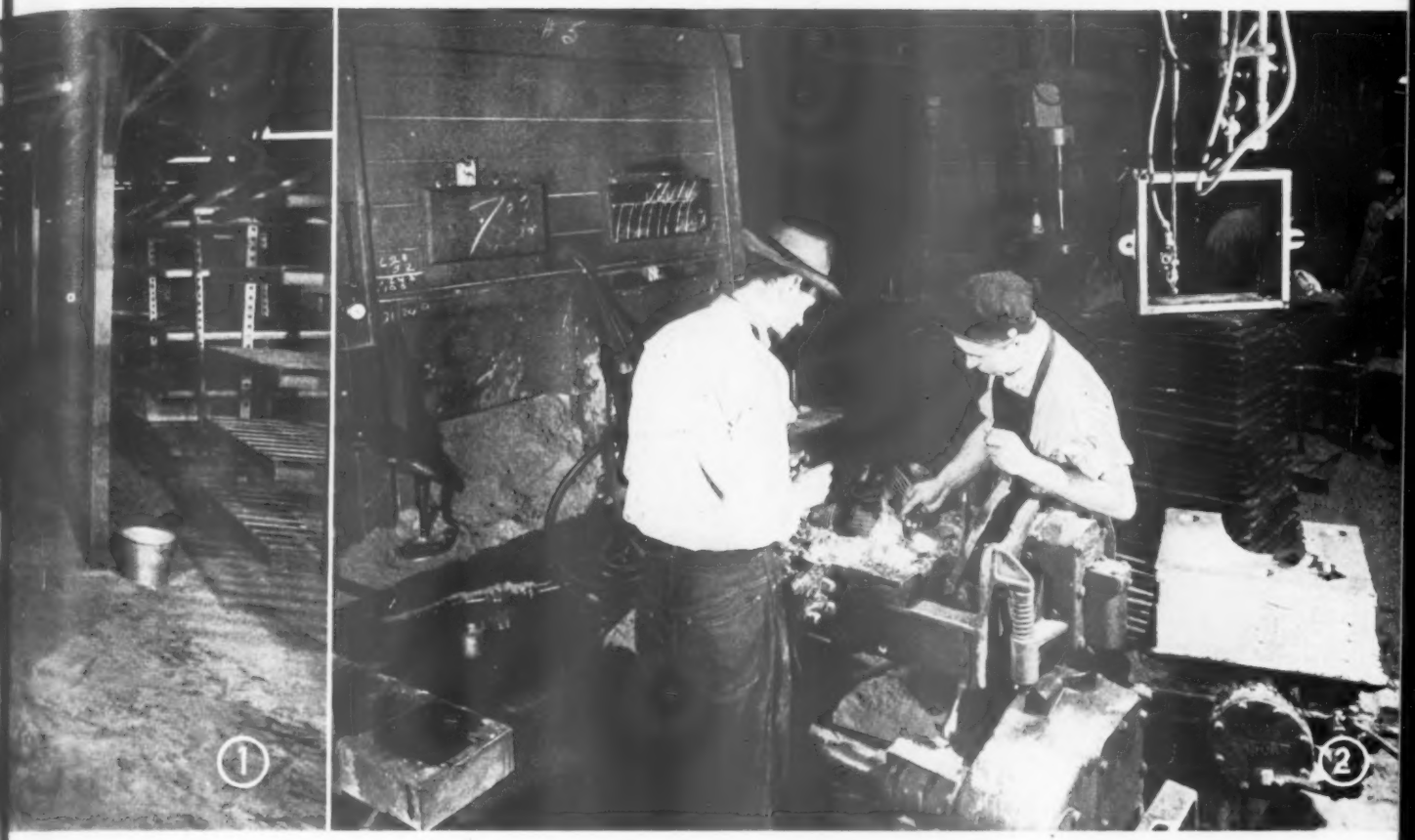
ALUMINUM castings made by Chrysler Corp.'s Dodge Chicago aircraft engine plant, are produced in a foundry identical in size to that of the adjoining magnesium foundry, which was described in the August issue of THE FOUNDRY. Together these two foundries represent by far the greatest concentration of light metal casting capacity in one plant in the world, and individually each is considered to be the largest of its type in existence.

In contrast to the magnesium foundry, which makes a variety of castings for the Wright 18-cylinder, 2200-horsepower air-cooled engine built at this plant, the aluminum foundry produces only one type, the finned cylinder head. While the head is a complicated casting to make, the fact that production is confined to this one part eliminates some of the difficulties commonly encountered when it is necessary to arrange molding and pouring facilities to accommodate a wide range in size of product. Nevertheless, it was a noteworthy accomplishment that, starting from scratch, a foundry of this size was built, equipped, manned and in large-scale production within only a little more than a year. Months ago more than 150,000 pounds of aluminum was being melted daily.

Heads for this powerful air-cooled engine, which is being used on the Army Air Force's B-29 and other large planes, weigh 40 pounds each, or a total of 720 pounds of cast aluminum heads for each engine. To obtain adequate heat dissipation the heads are finned liberally, the fins being spaced five to the inch and as much as 4 inches deep at some points. The care necessary in molding, and the difficulties to be overcome in attaining mass production of this part, are obvious.

The aluminum foundry, well lighted and ventilated throughout, measures 750 x 480 feet including offices, and is of reinforced concrete construction incorporating a ribbed concrete arch roof. Operations progress lengthwise of the building from the sand preparation department at one end, through molding, core baking, mold assembly, pouring, and cleaning and inspection. The building is extensively conveyorized, an important factor in attaining mass production and smooth flow of material in process. In addition, it obviates the necessity of accumulating a large floating bank of molds and cores. Monorail conveyors carry the mold components from molding stations through drying ovens to assembly stations; assembled molds move past the melting department on conveyor cars; gates and risers after removal from the castings are carried by overhead conveyor to the remelting furnace, and similar handling is employed to take castings to and from the cleaning department.

Sand is prepared at a balcony station located at one



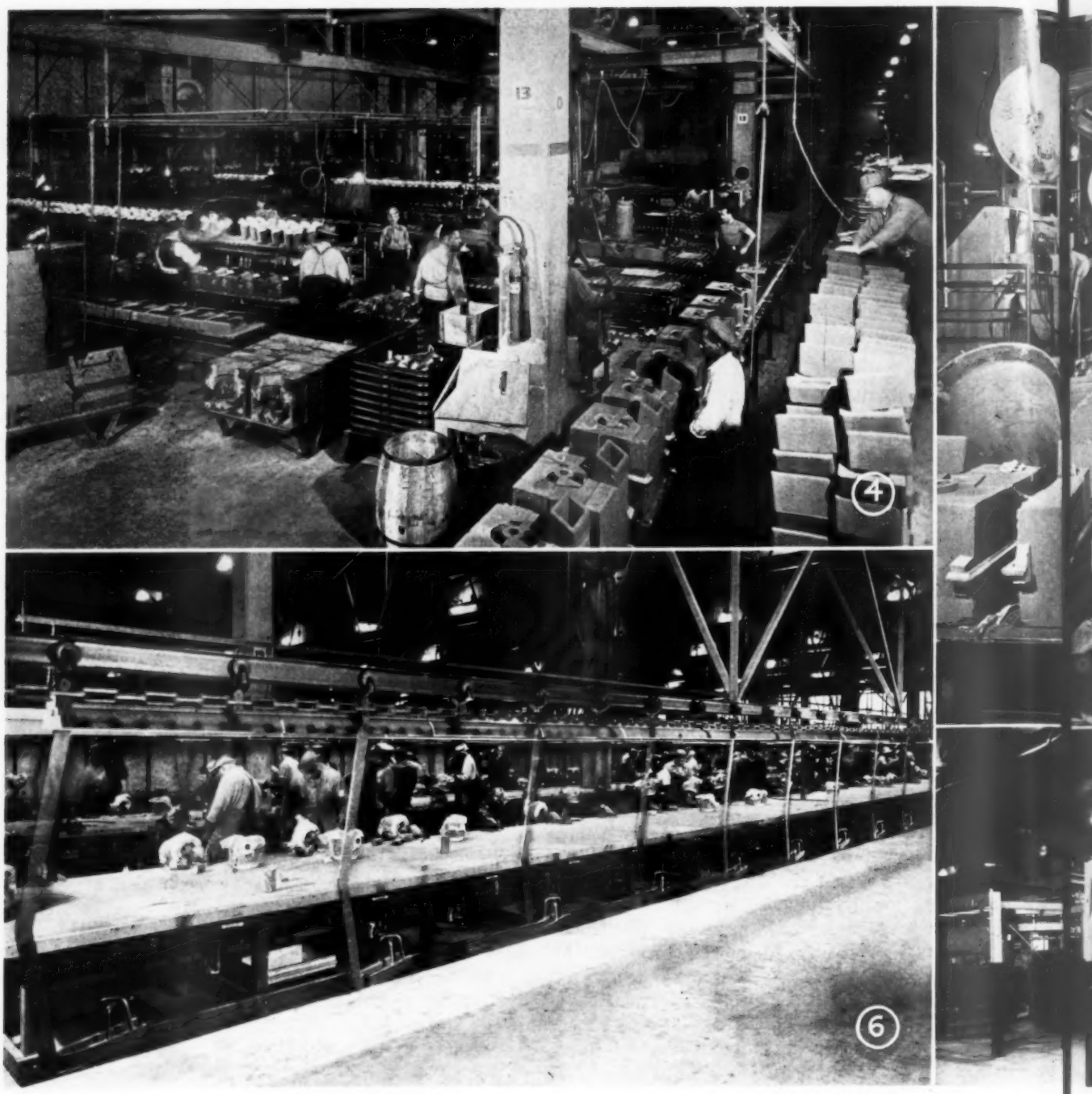
end of the building and from which elevated passageways lead over the molding lines extending along the floor below. Mixing equipment consists of two batteries of three 1200-pound-capacity, muller type units. Transfer of mixed sand to the molders' bins is one exception to the widespread use of mechanical handling elsewhere in the foundry. In this case the mulled sand is dumped into small cars which are pushed over track on the passageways and emptied into chutes leading to the bins at individual molding stations on the main floor.

The cylinder heads are poured in core molds, and the sand used is a lake sand of 65 grain fineness mixed with oil in the proportion of 87 to 1. This mixture, used both as facing and backing material, has a dry permeability of 75 and tensile strength of 125 pounds. Tests of physical properties are made regularly. Sand is reclaimed after use, the processing unit being of the thermal type similar to that employed in the magnesium foundry and described in the August issue.

A high degree of skill is called for in molding the finned heads, but an unusually good rate of production has been attained in this somewhat tedious operation. Views of one of the molding lines are shown in Figs. 1 and 2, both of which are of the cope line. A monorail conveyor equipped with racks separates this line from an adjoining line where drags are molded. The conveyor serves both lines, transporting finished molds to the baking ovens. Each rack usually holds five copes and five drags. Slab cores, incorporating the mold gate, runner and a blind riser, are molded by machine on another line.

Two molders work at opposite sides of each station where the copes and drags are made in snap flasks on jolt rollover pattern draw machines. After the brass pattern is placed in position sand is built up slightly on the base, and reinforcing nails, consisting of thin wires,

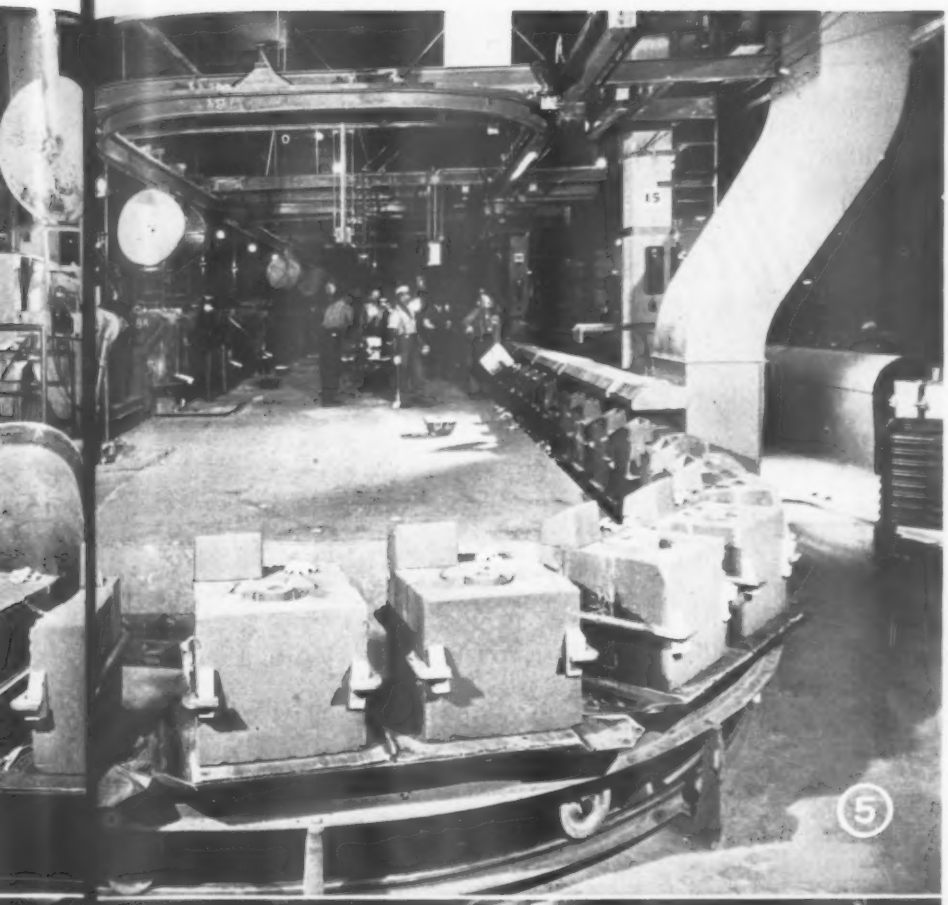
Fig. 1—One of the molding lines of aluminum cylinder head foundry. Conveyor at right serves this line, where copes are molded, and adjoining drag line. Fig. 2—Inserting reinforcing wires in head fins. Two men work at each station, turning out an average of about eight copes or drags per hour. Fig. 3—Closeup view at a burring bench gives general idea of massiveness of 40-pound head for the 2200-horsepower engine



are inserted in the sand between the pattern fins, as illustrated in Fig. 2. The wires project somewhat from the pattern to give the sand fin anchorage to the rest of the mold. Sand between the fins throughout the face of the pattern is reinforced in this manner, although the number of wires used—approximately 120 for each cope and drag, or 240 for the entire head—is considerably smaller than frequently has been employed in the past for heads smaller than this one. This has been a factor in enabling each station molding team to attain an average production of approximately eight copes or drags per hour.

After the fin reinforcing is completed, a snap flask is put in place. Additional sand is added, right angle rods are inserted to strengthen the mold corners, and the molding is finished by jolt and hand ramming. A bottom board then is clamped in position, the mold is rolled over, and after the pattern has been vibrated vertically it is ready for drawing. Pattern drawing naturally is conducted with considerable care to avoid disturbing the finned sections, inasmuch as these fins have only a slight taper from base to outer edge. When the pattern has been drawn and the snap flask removed, the mold face is sprayed with a fluoride solution before it is placed on a conveyor rack for transfer to the baking ovens. This spray application helps to strengthen the fins.

As the various mold components emerge from the ovens they are removed from the racks and placed on separate roller conveyors leading to the assembly stations. Conveyors are arranged conveniently for the as-



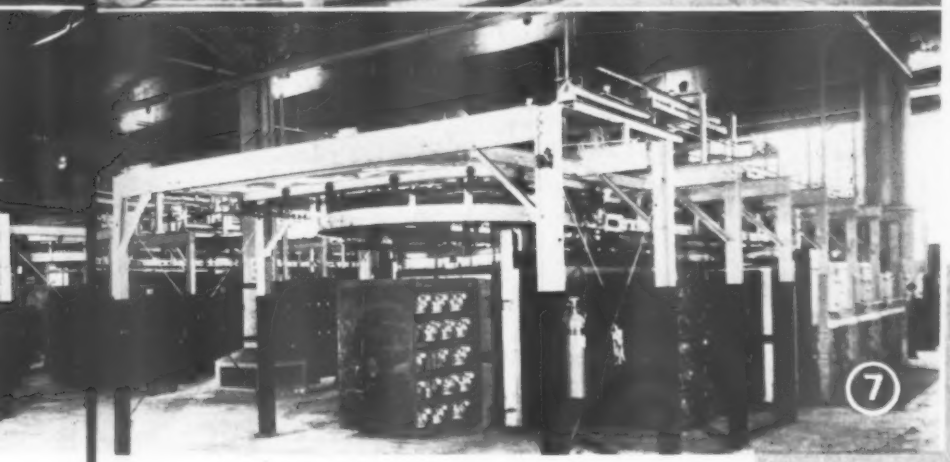


Fig. 4—Molds are assembled as components are received from baking oven in left background. Conveyor cars at right take assembled molds to pouring department. Fig. 5—Pouring cylinder heads as molds travel on continuous conveyor. An exhaust-equipped hood encloses molds during and after pouring. Melting equipment includes eight 3000-pound capacity furnaces. Fig. 6—Rough cleaned castings are brought to and from burring benches by monorail conveyor. Fig. 7—Two of the foundry's heat treating furnaces

core is set, the drag is pasted to a slab core, one of which is shown in tilted position at the left of Fig. 4. This core, made to the same length and width as the drag and cope but approximately one-half the depth, contains the gate and a runner, which introduces molten metal through two branches at the bottom of the mold. The cope is located on the drag with the assistance of three bosses projecting from the former's face which fit into corresponding recesses in the drag, the joint being sealed with paste.

Rollers at the end of the conveyor line are split, thereby permitting two clamps to be wedged in place on opposite sides of the mold when the assembly has been pushed to the end point. The mold then is lifted by an air hoist, rolled 90 degrees, and set down on a nearby conveyor car train which travels over tracks to the melting and pouring platform. In this position for pouring, the mold cope and drag are on end, with the top of the cylinder head cavity down and the main riser extending from what normally is the head's base. The final assembly operation is the pasting of the dry sand pouring cup over the gate opening. These basins, shown stacked to the right in Fig. 4, are slanted at the top edge. This provides a larger opening to the lip of the pouring ladle and helps to prevent spilled metal.

semblers, as will be seen in Fig. 4, so that all of the mold parts are within easy reach. Faces of the copes, drags, and flat slab core first are smoked with an acetylene torch and then pushed along for assembly. While facing the drag conveyor line an operator has only to reach to another line above him to pick up an internal core, while a slab core is obtained from a line in back of him. The cope is hoisted from the adjacent cope conveyor by an assembler on the other side of the drag line.

The internal core is a pasted assembly of sections comprising the combustion chamber and valve ports. Flanged sections at one end assist in positioning this core accurately in the drag by fitting into a recess at the edge of the latter. This end eventually becomes the top of the mold when the casting is poured. After the

The S.A.E. specification applying to production of these cylinder heads is AMS 4220A, and the ingot used is commercial alloy No. 142. Principal alloying elements of this metal are 4 per cent copper, 2 per cent nickel, 1.5 per cent magnesium (*Please turn to page* 198)

By A. E. CARTWRIGHT
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How to Melt BRONZE

Selection of raw materials is discussed in this first of two articles comprising a paper presented before the recent conference of the Eastern Canada and Newfoundland Chapter of the A.F.A. in New Glasgow, Nova Scotia.

THE most logical starting point for a discussion of bronze melting is that of the raw materials from which the final alloy is to be produced. These deserve careful consideration in their selection because any serious shortcomings in raw materials almost certainly will be inherited by the final product and probably will be present in aggravated degree.

For the purpose of this paper it will be assumed that the castings are required to be of reasonably high quality, meeting normal specification requirements of composition limits and physical properties suitable for modern engineering duty. We will not be concerned with brass or bronze castings whose sole requirement is that they should be yellow or red metal.

While the absolute necessity for meeting fairly rigid specifications for war supplies made imperative the standardization of raw materials quality in order that all foundries should be able to meet specification limits regardless of whether or not they had facilities for controlling these limits within their own organization, it is proposed to consider not only the use of certified ingot metals as a base for metal charges but also the use of scrap and virgin metals which prevailed before the war.

Four Ways To Make Alloy

Charges to produce an alloy of a desired composition may be made by one, or a combination, of four general types: Ingot alloy purchased to specified analysis; calculated combination of scrap metals purchased from a scrap dealer; virgin metals melted in the required proportions; one base metal to which is added a rich alloy (hardener) containing the remaining metals of the desired composition.

Ingot alloys have several advantages over the other types. Ingot metal purchased to certified analysis is or should be properly alloyed when the foundry receives it. Any slight losses in remelting the ingot easily may be determined and corrected by small additions of the lost metals. Ingots are heavy sections and expose the least amount of metal surface to oxidation during melting; therefore they require less effort and uncertainty to correct by fluxing, degasifying or deoxidizing. Ingot melting is the most practical method for repeatedly producing an accurate composition for any foundry that has no chemical laboratory.

Chief disadvantage that may be associated with the use of ingot lies in the somewhat higher cost over carefully purchased scrap. However, where high quality castings to close specification are required, the saving effected through the use of miscellaneous scrap may be more than offset by losses in the foundry.

Examine Raw Material Carefully

Ingot alloys generally are not made from virgin metals but from purchased scrap. The smelter continuously engaged in sorting and using this scrap generally is more competent to sort it out accurately than a foundryman whose business is not wholly concerned with evaluating scrap metals. Nevertheless, not all ingot is good ingot and not all manufacturers invariably produce high quality ingot. Close competition in prices may tempt an ingot maker to sell ingot made from inferior scrap. Careless methods in sorting and smelting can result in poor quality, gassy, and dirty ingot metal coming to the foundry.

Purchased ingot metal should be examined closely inside and outside. A fractured ingot surface should be clean and close grained. Chemical analysis should be checked before releasing the ingot for production. A trial heat should be poured into castings and test bars before allowing the shipment to be mixed with satisfactory metal already on hand. If the ingot is quarantined until these tests have been made, the metal may be sent back to the ingot maker if (*Please turn to page* 186)

Gas Developed in Molds

By NORMAN J. DUNBECK
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Effort, O.

ALL foundrymen realize the detrimental effect of gas as a cause of some scrap castings. Foundrymen generally realize that the tempering water creates the major portion of the gas evolved. However, in all probability, only a comparatively small number of foundrymen realize the magnitude of the total gas evolution. For example, a good synthetic sand containing sea coal, which is worked at as low as 2.5 per cent water, may generate 400 cubic feet of gas per cubic foot of sand at 1800 degrees Fahr., while a strong, naturally bonded sand containing sea coal may generate 800 cubic feet of gas. Actual figures on gas evolution and hot permeability of common molding materials may be interesting and informative.

Table I gives the gas evolution from the simplest mixtures of washed and dried silica sand, bond clays and water. It is evident that little gas is given off by the clays and sands and that the major portion of gas is from tempering water. Sand with Ohio fire clay gives more gas than sands bonded with the bentonite. simply because more tempering water is necessary in the mixture.

Table II shows the amount of gas contributed by auxiliary binders and casting cleaning elements, such as sea coal. The total gas reflects not only the gas contributed by the materials themselves, but by the additional tempering water sometimes made necessary by such additions. It will be noted that the addition of sea coal to a bentonite sand mix increased the total gas from 232.3 cubic feet to 409.6 cubic feet. Pitch, when used in the proportion of 1 to 35 by volume, will give the same casting cleaning action as sea coal 1 to 10 and only 312.8 cubic feet of gas. Pitch has the further action of increasing dry strength which may be of advantage in some cases and disadvantage in others.

The usual dry binders in the table developed similar amounts of gas with the exception of special binder B, which is notably lower. This binder is unusual in that the mixed sand, of high dry strength, develops less gas than a plain bentonite-sand-water mixture because it is workable at lower moisture content.

In Table III the higher amount of gas evolved by the bank sand undoubtedly is due to the presence of organic material and carbonates.

Gas Evolution and Hot Permeability

Bond Clay Added	Per Cent Tempering Water	CC Gas Evolved per Gram of Sand — Gas from Dried Specimen ½ min.	Gas from Dried Specimen 3 min.	Gas from Dried Specimen 7 min.	Steam @ 212° F.	Total Gas 212° F.	Total Gas 1800° F.	Cubic feet gas at 1800° F. per cubic foot of sand
TABLE I. Washed and Dried Silica Sand Plus Bond Clays								
5% Western bentonite	2.5	.50	2 50	2.50	40.0	43 3	145.2	232 3
4% Southern bentonite	2.5	3.50	3 50	3 50	41.3	46.1	154.9	247.8
11% Ohio fire clay	3.5	3.00	3.00	3.00	56.5	60.3	203.0	324.8
TABLE II. Silica Sand Bonded with 5 Per Cent Western Bentonite and Other Binders								
1-10 Sea coal (vol.)	3.0	9 00	19 50	19 75	49 8	76.2	256.0	409.6
1-35 Pitch (vol.)	2.9	4.25	7.50	7.50	48 2	58 2	195 5	312.8
1% Cereal binder	3.4	7.25	9.50	9.50	56.5	69 0	231.8	370 9
1% Resin binder	3 4	5 25	7.00	7.00	56.5	65.4	219.7	351.5
1% Special binder A	3 5	4.25	7.00	7 00	58.0	67.3	226.0	361 6
1% Special binder B	2 0	2.25	3 75	3.75	33.2	37.7	126 7	202 7
1% Dextrine	3.5	8.00	8.75	8.75	58.0	69.6	234.0	374.4
TABLE III. Silica Sands Bonded with 5 Per Cent Western Bentonite and 1-10 Sea Coal by Volume.								
Washed and dried Ottawa	3.0	9.00	19 50	19.75	49 8	76.2	256 0	409.6
Western Michigan core sand	2 9	5.00	15 25	15.25	48 2	68.4	229.8	367.7
Michigan bank sand	2.8	10.25	25.00	25.50	46.5	80.3	270.0	432.0
TABLE IV. Gas Evolution from Sands in Actual Use.								
Steel foundry-old sand	2 0	4.50	5.25	5.25	33.2	40.1	134.7	215 5
Steel foundry-facing sand	3.1	12 25	13.25	13 25	51.4	69.1	232 0	371.2
Malleable foundry-system sand	3.7	9 75	18.00	18 25	61.5	85.5	288 0	460.8
Malleable foundry-facing sand	3 8	16.25	27.75	27.75	63.0	99.4	334 0	534.4
Gray iron foundry-system sand	3.8	11.25	28.75	33.00	63.0	106.5	358.0	572.8
TABLE V. Synthetic Sand vs. Naturally Bonded Bond								
95% Washed and dried Ottawa								
5% Western bentonite	2.5	.50	2.50	2.50	40.0	43.3	145.2	232.3
New Albany sand	4.8	9 00	11.00	11.00	78.0	93 3	314.0	502.4
New Ohio sand	7.8	11.00	15.25	15.25	124.8	145.0	486.5	778.3

Table IV gives gas evolution from regularly used foundry sands. Despite the presumed build-up of dead clay and unburned cereal binder in the steel foundry old sand, the evolved gas is very low. The steel foundry facing sand is made from 700 pounds old sand, 700 pounds crude silica sand, 24 pounds western bentonite and 19 pounds dextrine. Even with these additions, gas is still at a modest figure.

However, a substantial amount of gas is given off from the malleable foundry system sand, and a further increase in the malleable foundry facing sand. This facing sand consists of 800 pounds old sand, 450 cubic inches Ohio fire clay, 450 cubic inches sea coal and 3 pints fuel oil.

The system sand from a gray iron foundry consists of burned Michigan core sand, southern bentonite and sea coal. All the sand in the system is facing. Although the gas evolution of 572.6 cubic feet of gas per cubic foot of sand seems high, this is a closely controlled sand in a well run foundry and the gas may be considered to be average or on the low side for a sand containing a substantial amount of sea coal.

Table V shows the high gas content of naturally bonded sands as compared with synthetic sands. More gas is evolved from the naturally bonded sands, due to gas forming elements actually present, but the large amount of total gas is due to the large amount of tempering water required to put the sands in proper working condition.

In summing up it may be said that a gas determinator now may be purchased at a reasonable price. Its use adds another helpful method of sand control. Large foundries may wish to own one and it seems desirable that all foundries have occasional tests made to build up a history of their sands as to gas evolution. If these tests were made once a month, it then would be possible to correlate gas content with blows and the foundry could establish the danger point. Thereafter, whenever the danger point was approached, proper remedial action could be taken before scrap was produced.

In ordinary laboratory testing, permeability is the ability of a sand to vent gas. Obviously, different conditions prevail at high and low temperatures. At high temperature the silica grains expand, thus reducing the pore space in the sand. Also, water changes to gas, combustible materials burn and produce gas in the sand. Considerable pressure may be built up if the combustion is rapid.

As pointed out by Harry W. Dietert, two sets of test figures are needed. One showing permeability as ordinarily measured, and another set showing back pressure. Hot permeability is measured by an attachment to the high temperature testing furnace or dilatometer and back pressure by a manometer attached to the permeability meter.

Gas will travel away from any mold face if the metal pressure is greater than the back pressure at the mold face, and the reverse. The tester is concerned with the actual hot permeability, the amount of gas evolved and the rate at which it will flow. Time is an important element, but to develop some comparative figures, a 4-minute interval was used in the following tests. Hot permeability, back pressure and amount of gas to be vented are all listed.

The safest condition is represented by minimum gas evolution plus high hot per- (*Please turn to page* 178)

Effect of Permeability at High Temperature

	Per Cent Tempering Water	A.F.A. Specimen 70° F.	1⅛" Specimen 70° F.	1⅛" Specimen 2500° F.-4 min.	Back Pressure Grams	Total Gas 2500° F.-4 min. cc per gm. sand
TABLE VI. Washed and Dried Ottawa Sand Plus Bond Clays						
5% Western bentonite	2.5	330	290	150	6.6	242
4% Southern bentonite	2.5	375	294	158	5.8	258
11% Ohio fire clay	3.5	220	148	111	12.5	338
TABLE VII. Silica Sand Bonded 5 Per Cent Western Bentonite Plus Other Binders						
1-10 Sea coal (vol.)	3.0	230	173	58	14.0	427
1-35 Pitch (vol.)	2.9	242	180	77	10.0	326
1% Cereal binder	3.4	280	170	86	15.5	341
1% Resin binder	3.4	187	140	93	18.0	366
1% Special binder A	3.5	325	220	114	10.8	377
1% Special binder B	2.0	325	284	144	7.5	211
1% Dextrine	3.5	380	298	123	8.4	390
TABLE VIII. Silica Sands Bonded with 5 Per Cent Western Bentonite and 1-10 Sea Coal by Volume						
Washed and dried Ottawa	3.0	230	173	58	14.0	427
Western Michigan core sand	2.9	240	157	33	16.2	383
Michigan bank sand	2.8	35	30	2	114.0	450
TABLE IX. Actual Foundry Sand						
Steel foundry-old sand	2.0	140	116	42	40.5	310
Steel foundry-facing sand	3.1	270	154	42	16.2	388
Malleable foundry-system sand	3.7	47	25	0	78.5	480
Malleable foundry-facing sand	3.8	32	13	0	242.0	556
Gray iron foundry-system sand	3.8	70	36	0	62.0	595
TABLE X. Synthetic Sand vs. Naturally Bonded Sand						
95% Washed and dried Ottawa						
5% Western bentonite	2.5	330	290	150	6.6	242
New Albany sand—No. 00	4.8	2	2	0	400 plus	410
New Ohio sand	7.8	68	40	0	400 plus	812

Rapid Routine Methods for SLAG ANALYSIS

By ROBERT A. WILLEY
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Commercial Steel Castings Co.
Marion, O.

ABOUT a year and a half ago we were confronted with the problem of analyzing the slag from our acid open hearth furnace. The methods suggested by Lundell and others in *Chemical Analysis of Iron and Steel,* involving fusions, precipitation and drying to constant weight, were too time consuming and required technique beyond the average chemical operator. Hence, the problem of rapid and reasonably accurate methods for slag control was solved by employing the following methods.

Methods employed here involved, in most cases, the solution of the slag in concentrated hydrochloric and hydrofluoric acids in a pyrex erlenmeyer flask. Naturally, this resulted in the flask being etched. However, if not too much hydrofluoric acid is used 20-25 determinations can be made before it is necessary to discard the flask.

As the National Bureau of Standards issues no standard slag, it was not possible to check these methods with a slag of known content. However, these methods can be checked by the same analyst and by two analysts working with the same sample also. Complete analysis of a slag indicated reasonably accurate results.

Slag Samples: It has been pointed out by Herty that if a true analysis of the ferrous oxide (FeO) and ferric oxide (Fe_2O_3) in the main body of the slag is desired it is necessary to avoid taking too much of the top of the slag. The sample is taken by first slagging the spoon and then dipping the spoon deep into the body of the slag, then carefully pouring the slag into a Herty *viscosimeter.* The sample then is crushed and quartered until about one gram is left. This is pulverized in a tool steel mortar until it all passes through an 80 mesh screen. The metallic steel is removed by a magnet and the sample analyzed.

For the determination of MnO in acid slag, treat one-tenth gram of the finely powdered sample in a 250 milliliter flask with 30 milliliters of dissolving solution and 10 to 15 drops of hydrofluoric acid. Heat until in solution and add 80 milliliters of hot water and 30 milliliters of ammonium persulphate solution. Heat to boiling and boil one-half minute. Cool to 30 degrees Cent. or lower and titrate rapidly with standard arsenite solution to a clear yellow end point.

Solutions required include:

1. Dissolving mixture—Dissolve 3.5 grams silver nitrate in 525 milliliters of water. Add carefully 100 milliliters sulphuric acid, cool, add 250 milliliters phosphoric acid and 250 milliliters nitric acid.

2. Ammonium persulphate—Dissolve 15 grams of the salt in 100 milliliters of water.

3. Sodium Arsenite—Dissolve 3 grams of sodium arsenite in water and dilute to 1 liter. Standardize with a Bureau of Standard steel of known Mn content.

$$\% \text{ MnO factor} = \frac{\text{milligrams Mn in standard steel} \times 1.2913}{\text{milliliters of arsenite}}$$

It is suggested that 10 milligrams of standard steel be used to determine MnO factor, for example, U. S. Standard No. 100.

NOTE: Ammonium fluoride can be used in place of hydrofluoric acid.

For determination of CaO in basic or acid open hearth slags, dissolve 0.500-gram slag in a 400 milliliter beaker with 20 milliliters of perchloric acid and 15 to 20 drops of hydrofluoric acid. Heat until in solution. Fume hard if necessary. Cool, dilute to 50 milliliters. Make ammoniacal with ammonium hydroxide and dilute to 200 milliliters with hot water. Bring to a boil and add 40 milliliters of hot ammonium oxalate. Boil 1 minute. Add 1 gram of solid oxalic acid and boil 3 minutes.

Filter through Whatman No. 30 paper and wash free from oxalic acid with hot water. Wash precipitate back into original beaker. Fold paper and hang on edge of beaker. Add 30 milliliters sulphuric acid (1-1), then dilute to 300 milliliters with hot water. All of the precipitate should dissolve. If not, place on hot plate until in solution, then titrate with standard potassium permanganate. When end point is obtained, throw in the folded paper, stir well and titrate until a second end point is obtained and calculate percentage of CaO.

Solutions required are:

1. Standard $KMnO_4$—Dissolve 5.855 grams of potassium permanganate and dilute to 1000 milliliters. 1 milliliter = 1 per cent CaO

2. Ammonium oxalate saturated solution—Dissolve in hot water and allow to cool.

If N/10 $KMnO_4$ solution containing 3.1606 grams of potassium permanganate per liter is used, one milliliter is equal to 0.002004-gram Ca or 0.002804-gram CaO

NOTE: If desired the calcium oxalate may be caught in a filter crucible thus eliminating second end point.

For determination of silica in acid or basic slag: To a ½ gram sample in a 250 milliliter beaker, add 10 milliliters hot water, 10 milliliters hydrochloric acid, 15 milliliters perchloric acid (60%). Shake while making additions to prevent caking. A few milliliters of nitric acid may be added to prevent bumping. Take to strong fumes. Cool, add 5 milliliters hydrochloric acid, boil until clear, dilute with 50 milliliters hot water, filter using suction, wash twice with 1-1 hydrochloric acid then with hot water until free of acid. (*Please turn to page* 180)

QUESTIONS and ANSWERS

Drossing in Manganese Bronze

Q.—We are having trouble with a 3-blade manganese bronze propeller U. S. Navy specification 49B3e, dimension of blade 11¼ x 23½-inches, made in a part green sand and part core mold. The crucible heat for each casting includes 350 pounds metal, 2½ pounds glass and 4 pounds of fluxing material. The metal is poured at a temperature of 1975 degrees Fahr. through a two-step sprue and enters the bottom of the hub through a horn gate with the large opening at the hub end. The casting in the rough weighs 300 pounds. We have tried all virgin ingot metal and also combinations of ingot and scrap, but all the castings show drossy areas in the hub about halfway between top and bottom. Occasionally dross also appears in the blades.

A.—Aluminum content in manganese bronze forms an oxide skin or envelope around the alloy which when broken by turbulence or agitation of the metal forms inclusions or dross. Hence, where the metal is poured carelessly, where it strikes an obstruction or where the stream is agitated from any other cause the aluminum oxide skin becomes enmeshed in the metal. Theoretically, the dross should float on top of the metal and eventually reach the riser where it will do no harm, but theory is subject to a limiting factor. Limiting factor in this case is that the rising dross comes in contact with the cold wall of the mold and sticks there. The hot metal continues to rise around the drossy material, but does not dislodge it. Usual practice in cases of this kind is to station a man armed with ¼-inch steel rod above the top of the open riser which presumably is a continuation of the hub. By moving the lower end of the rod in a circular direction he can keep the dross in motion and prevent it from sticking to the wall of the mold.

Cutting Due to Many Causes

Q.—We shall appreciate information on mixtures for nonferrous foundry facing sands. Our present sand moisture content is 6.5 to 7.5 per cent, permeability 25 to 30, green strength 6 to 7 pounds. We find signs of cutting in the gates and runners. The metal is a 50-50 per cent mixture of lead and copper poured at a temperature range between 1950 and 2050 degrees Fahr.

A.—Sand cutting in the gates and runners may be caused by excessive moisture, hard ramming, low green strength, low hot strength, or by a combination of two or more of these factors. Your present moisture content, permeability and green strength conform to accepted standards, therefore the probable cause of the trouble is low hot strength. Sand that is low in clay or other bonding material content crumbles in contact with rapidly flowing metal. The obvious remedy is to increase the amount of natural or artificial bonding material. The amount will vary depending on the size and shape of the casting, size and number of gates, temperature of metal and speed of pouring.

The bonding material also may vary to a considerable extent and includes fire clay, bentonite, or any of the dry, water soluble, or oil binders used in coremaking practice. In many instances it is not necessary to incorporate the additional binder in the facing sand mixture. A thin solution is sprayed over the gates and runners and, where necessary, over part or all of the mold face. This temporary strengthening of the sand surface is sufficient where the amount of metal is not too great and where, therefore, the sand is not subjected to the flowing, eroding action of the metal stream for an excessive period.

Figure Cupola Charge Yield

Q.—Have you any tables or statistics showing the shrinkage involved in making gray iron castings from the time the charge enters the furnace until all the metal has been poured?

A.—The question is subject to two interpretations. Does it refer to the amount of metal actually lost as a result of the melting operation, or, does it refer to the discrepancy between the weight of metal charged into the cupola and the weight of salable castings? In the first case the late Dr. Moldenke conducted extensive experiments. The result published in his well-known work *Principles of Iron Founding* shows the average melting loss of the several kinds of foundry metal going into ordinary mixtures: Machine cast pig iron 0.30 per cent, sand cast pig iron 1 per cent, car wheel scrap 2 per cent, first quality machine scrap 2.50 per cent, light machine scrap 3.50 per cent, stove plate scrap 8 per cent. The author also points out that with a large amount of burned or excessively rusted stove plate scrap the loss may reach 14 per cent.

In THE FOUNDRY for January, 1936, J. A. Lanigan presented a discussion on this subject based on a series of tests conducted over a period of 6 months in one of the foundries operated by a large corporation. Results showed the following melting loss: Machine cast pig iron 0.003 per cent, No. 1 machinery scrap 0.65 per cent, light machinery scrap 0.98 per cent, car wheel scrap 0.68 per cent, clean stove plate scrap 2.75 per cent, old stove plate 5.85 per cent. A heat made up of 50 per cent pig and 50 per cent car wheel boring briquets without binder showed a loss of 1.23 per cent. In a heat of briquets alone the loss was 2.01 per cent. A heat of 75 per cent pig iron and 25 per cent car wheel borings packed in containers resulted in a melting loss of 3.01 per cent.

In the second interpretation, difference between weight of metal charged and weight of castings shipped, there are too many variables involved for a definite answer. Each case must be considered by itself. For example on one class of castings the gates and sprues may not amount to 10 per cent of the weight of the castings, while on another class the weight of the gates and sprues may equal that of the castings.

Gives Data on Casting Monel

Q.—We will appreciate obtaining any data you have on casting monel metal. Are special pots or crucibles needed or will ordinary graphite pots do?

A.—While the common graphite crucible used for melting brass and bronze can be used for melting monel metal, it is not as well suited for that work as clay-graphite crucibles designed for high temperatures or silicon-carbide crucibles. Coke-fired pit furnaces are not recommended due to the danger of contamination of the metal by sulphur. With oil-fired furnaces the flame should be adjusted to provide an oxidizing flame. Also the oil should be low in sulphur. Some protect the melt by using a clean crucible cover with no slag, while others prefer a lead-free glass slag covering.

After the metal is molten the temperature is raised to 50 to 75 degrees above that for pouring, and about 3 to 5 minutes before pouring about 0.5 per cent silicon is added as 95 per cent silicon metal followed by a similar amount of manganese added as manganese metal or 80 per cent ferromanganese. Generally, the amount of silicon and manganese added is such as to provide 1.25 per cent silicon and 1.0 per cent manganese in the final metal. Final deoxidation is accomplished with 0.1 per cent metallic magnesium in stick form fastened to a rod and plunged beneath the surface until action ceases.

Sands and molding practice for monel metal follow steel founding practice more than any of the other branches. Sands must be refractory, and large heads and gates are used to insure solid castings. Small castings up to 15 pounds can be made in green sand, but over that dry sand molds generally are used. Cores are made with silica sand and core oil binders, and should be well vented. They should be such that they collapse easily as solidification shrinkage occurs. Pouring temperature usually is from 2700 to 2750 degrees Fahr., although in the case of thin castings it may be as much as 2800 degrees, or higher.

Salvaging Leaking Castings

Q.—We will appreciate full details of methods for stopping leaks due to porosity in gray iron housing castings 3/16-inch thick which are subject to city water pressure. Due to design it is not possible for us to process them with a solution under pressure. We have heard of sal ammoniac being used and also sodium silicate, and would like information on the procedure.

A.—We do not quite understand what you mean when you say that due to design you cannot use a solution under pressure since you mention that the castings are subject to pressure. Presumably you mean that the castings have numerous openings, but that difficulty can be overcome by designing a fixture which will seal all but one opening—and that is common practice, especially where castings must undergo a pressure acceptance test.

So far as we know sodium silicate or water glass is used only on aluminum alloys, and not to such a great extent since other more suitable materials have been developed. One trouble with sodium silicate is that it is water soluble unless some agent like calcium chloride is applied after impregnation with the silicate solution; resulting in precipitation of an insoluble silica compound. Sal ammoniac was used to seal leaking gray iron castings since it resulted in precipitation of iron hydroxide, and later iron oxide in the porous areas. While in some cases the castings just were soaked in a strong solution of sal ammoniac, more satisfactory results were obtained by injection under pressure to insure penetration into the faulty area.

However, we believe that present day sealing practice generally involves the use of various proprietary materials comprised of synthetic resins, etc. which are put in place by soaking, under pressure, or by being subjected to vacuum and then by pressure. After draining and rinsing the casting, the sealing compound is solidified in place by application of heat. Since the methods of application vary, it is suggested that you get in touch with the various manufacturers whose names can be found in the advertising pages.

Positive Feeding Necessary

Q.—We make many brass bushings in our foundry from the 85-5-5-5 alloy. These are molded on the side using a split pattern, and where the wall thickness is ¾-inch or more we have been putting a wide flat gate over the cope to hold them up. We notice that many of the large brass bushing foundries apparently do not use any risers on top. We have tried that, but they shrink on top when cast on the side. Can you give us some recommendations as to the best procedure since the additional riser on the top takes considerable metal?

A.—Obviously an alloy which shrinks requires feeding, and since you use a riser on your castings, you know that some shrinkage occurs. Hence, it is purely a question of designing the most economical feeder. Of course, some manufacturers of bushings are indifferent as to the quality of their product, but those who take pride in their cast-

GANGWAY! By J. A. Patterson

"He gets lost!"

ings and desire to provide satisfactory service, spend a little more to insure maintenance of high standard—and they see that the castings are fed properly by sufficient risering.

Many bushing manufacturers make their castings on the side using a riser at one end with the metal entering through that riser. The riser being last to fill contains hot metal which can feed the casting during freezing. In general the procedure is designed so that two castings are fed from one riser, which, while larger than for supplying a single bushing, is not twice as large. Hence, a saving of metal is obtained through such a combination.

Also we believe that the practice mentioned is more economical in the cleaning room since it is much easier to cut off a riser at the end than it is to cut off a riser which extends the full length of the casting. The 85-5-5-5 alloy does not require the heavy risers needed with high shrinkage alloys such as manganese bronze, but if the casting must be sound and of good quality, adequate risering is necessary, and the riser must be located so as to insure proper feeding during solidification of the casting.

Holes in Bushing Are Caused by Gas

Q.—We are sending a thin section of a bushing which indicates the trouble we are having around the core. The alloy contains 70 per cent copper, 10 per cent tin and 20 per cent lead. Bushing is poured in an open mold, vertical position, gated at the bottom, and temperature is approximately 1800 degrees Fahr. All bushings giving us trouble have an average wall thickness of 1¾ inches, and cores range from 2½ to 3 inches in diameter. Cores are made from 8 quarts sharp sand, 2 quarts new molding sand, and ¼-pint boiled linseed oil. You will notice that the bushings are solid with the exception of the metal around the core.

A.—While it is possible that the core may be causing some of the holes, it is not evident in the thin slice sent to us, but if you think that a change in core mixture will help in alleviating the trouble you might try the following: On the same volume basis with your present practice use 10 quarts sharp sand, ¼-pint oil, and ½-pint cereal bond. Vent cores well, bake at 400 to 450 degrees Fahr. for 1 hour. Coat with red talc or graphite to eliminate metal penetration.

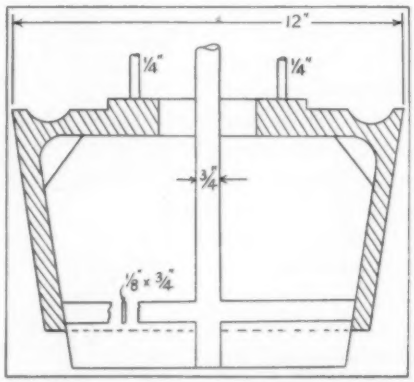
However, our impression is that your trouble is due to gassy metal, too low a pouring temperature, and perhaps lack of proper feeding. Examination of the fracture with a low power magnifying glass shows numerous small holes, intercrystalline shrinkage, and discolorations practically throughout the section. Therefore, we suggest that you give close attention to your melting practice to see that gassing is avoided. Do not use charcoal as a cover during melting unless you are sure that it is absolutely dry and thoroughly burned. Many foundrymen use a cover flux composed of glass or sand mixed thoroughly with some soda ash and borax.

Presumably you are deoxidizing your metal with a small amount of phosphor-copper as is the general practice. Do not fall into the error of increasing the amount with the expectation of getting rid of gassiness as it will not work, but likely will increase trouble from metal penetration. Addition of a small amount of copper or lead oxide 3 to 5 minutes before pouring will be of more value as a degasifier, and not more than 1½ ounces per hundred pounds should be employed. Also many foundrymen have used proprietary fluxes with success, and it is suggested you consult the advertising pages of THE FOUNDRY for names of manufacturers of those materials. They will be glad to supply information.

Cone May Be Gated Top or Bottom

Q.—We are having a considerable amount of trouble with a gray iron clutch cone casting about 12 inches diameter and weighing approximately 35 pounds in the rough, molded in a tapered snap flask 16 x 16 inches. We have gated it at the joint, also through the hole in the center at the top. Recently we placed a sprue on the outside from which the metal enters the mold through a dry sand core near the bottom. None of these methods is satisfactory. In the first two, the sand cuts. The third method does not cut the sand, but the dry sand core leaves an unsightly area on the face of the casting, and in addition the casting shrinks in the groove around the top edge. We use a synthetic sand bonded with bentonite and containing a small amount of sea coal. This sand seems to lack *body* and dries out too rapidly. We shall appreciate your opinion on a proper grade of sand, and a suitable gating system.

A.—An unsuitable grade of sand is one of the prolific causes of scrap castings, but that applies equally to either natural sand or synthetic sand. The fact that synthetic sand has been widely adopted in recent years, especially by production foundries, would indicate that it has been satisfactory. From the beginning of the industry, at least in the United States, steel foundries universally have used synthetic sand. Preparation, manipulation and general technique differ to some extent from ordinary natural sand practice. Of course it is possible that the sand you are forced to use is not what it should be, but it may be advisable to experiment with sample batches before reaching a final decision. You also might get in touch with the supplier of bonding material and have a technical trouble shooter sent to your plant to study the conditions and iron out the kinks.



Sketch showing two methods for gating a clutch cone

Several methods are available for gating the casting. Two methods are shown in the accompanying illustration. In the first, the metal is poured into a central ¾-inch sprue which extends to the bottom of the core print. Three or possibly four small gates ¼-inch diameter, or preferably ⅛ x ¾-inch deliver metal to the mold slightly above the bottom edge. This is the gentlest method of introducing the metal since it eliminates all danger of erosion from the flowing stream which in this instance rises easily in the mold. The only objection is that the method is at variance with the accepted theory that at the close of the pouring period the hottest and most liquid metal should be at the top. However, in this particular instance where the casting is small and thin and therefore freezes rapidly, this item is relatively unimportant.

The second method, and the one preferred in this instance is to pour the metal into a small basin on top of the cope from which it flows into the top of the mold through six ¼-inch diameter pencil gates arranged in a ring. The shrinkage in the bottom of the groove around the top is caused by a slight yielding of the sand body inside the slip jacket. The mold is strong enough to resist the static pressure up to a certain point. At this point, which means when the sprue finally is filled to the top, the mold yields a little on the lower part and the metal sinks in the vertical wall. The mold should be made in a rigid flask. The trouble is accentuated where all the metal enters through a gate or gates at the bottom.

High Quality Grate Bars Not Cheap

Q.—We shall appreciate information on the chemical specifications of a low cost, heat resisting grate bar, made from cupola iron, 100 per cent scrap charge.

A.—This inquiry may be interpreted from two view points. Is the bar one that can be sold at a low price, or a bar in which the cost is low on account of long life. If the first interpretation is correct the answer is that the heat resistance and consequent life of a bar made from an all scrap mixture is not high. If sufficient alloy material is added to increase the life, the bar cannot be sold at a low price. The ideal grate bar would be an alloy iron casting possessing high heat resisting properties.

A fairly satisfactory plain gray iron for grate bars shows the following approximate analysis: Silicon 2.00 per cent, manganese 0.60 per cent, sulphur 0.05 per cent, phosphorus 0.20 per cent, total carbon 3.50 per cent. Malleable bessemer pig iron forms the base. An alloy iron listed by *The Cast Metals Handbook*

(*Concluded on page* 92)

☆ ☆ *Nickel*

ASSURES CONSISTENTLY BETTER CASTINGS

Large or small . . . for all castings in which your customers demand improved physical properties, increased pressure requirements or greater wear resistance . . . Nickel will help you satisfy these demands.

Nickel also serves as a valuable tool within the foundry itself by alleviating such problems as porosity, shrinkage, chilled corners and edges and non-uniformity in castings of irregular section or unusual design.

Suitable forms of Nickel and Nickel alloys have been developed to simplify its use by both ferrous and non-ferrous foundrymen.

★

Our technical staff and the casting specialists of our distributors have had many years of experience with foundry problems. They will welcome the opportunity to cooperate with you.

THE INTERNATIONAL NICKEL COMPANY, INC. 67 WALL STREET NEW YORK 5, N. Y.

(*Concluded from page* 90)

for bars ranging in weight from 50 to 100 pounds shows the following analysis: Silicon 1.40 to 1.60 per cent, total carbon 3.20 to 3.60 per cent, combined carbon 0.60 to 0.90 per cent, sulphur 0.06 to 0.10 per cent, phosphorus 0.15 to 0.40 per cent, manganese 0.60 to 0.80 per cent, nickel 1.25 to 1.75 per cent, chromium 0.50 to 0.75 per cent. It is claimed that the life of bars conforming to this analysis is from 3 to 6 times the life of ordinary gray iron castings used for grate bars.

Mixes Irons From Two Cupolas

Q.—We run four types of iron through the cupola in one heat, ranging from no steel up to 30 per cent steel scrap in the charge, and find overlapping which we would like to eliminate. We have two cupolas, one lined to 28 inches and the other to 42 inches, but are only using the latter. We have been thinking of melting a base gray iron charge in the large cupola, and all steel in the small one; mixing the two types to meet the casting requirements. What do you think of the feasibility of that plan?

A.—Your plan of melting a "soft" iron in one cupola and a "hard" iron in another, and mixing the two is one that has been practiced by a well known foundry for the past 15 years or so for the production of iron for heavy pumps to withstand high pressure. The soft iron contains about 2.40 per cent silicon, and the hard iron about 1.35 per cent. Hard iron is melted in a 54-inch cupola using 1400 pounds steel rail, 135 pounds pig iron (15 per cent silicon), and 85 pounds spiegeleisen (20 per cent manganese). Soft iron is melted in a 72-inch cupola, and the two irons are mixed on the basis of 4 tons hard iron to 1 of soft.

You will note that the hard iron is not a straight steel charge since about 13.5 per cent is comprised of high silicon pig and spiegel. However, we know of cases where the steel content is as high as 93 per cent with ferromanganese and ferrosilicon, etc. comprising the remainder, and we believe that the latter are necessary as deoxidants and degasifiers to prevent wild heats. Your problem essentially will consist of setting up a base iron which presumably will be practically the same as you now are using, and a hard iron which mixed in various quantities with the base iron will meet the requirements of your different grades. Also you will have to adjust the melting rate of the smaller cupola (hard iron) to that of the large cupola so that the proper ratio is maintained.

On the basis of the charges that you mention, it would appear that the 28-inch cupola melting at the rate of 4 to 5 tons per hour would supply just the right amount of low-carbon, low-silicon iron to dilute the iron from the 42-inch cupola melting at the rate of 8 to 9 tons per hour. However, you would have to do some experimental work to determine whether that condition would hold in practice. Quite possibly you might find that by mixing two irons as proposed, the percentages of each would be considerably different than when all is melted in a single cupola.

For example, basing only on silicon content: If the soft iron contains 2.50 per cent silicon, the addition of 30 per cent steel scrap to the charge would result in say 1.75 per cent silicon in the final iron. Using the same soft iron, with a hard iron containing 1.0 per cent silicon; you would have to use about one-half of each to obtain a 1.75 per cent silicon in the final iron. Similarly if the hard iron contained only 0.50 per cent silicon, you would have to use about 62 per cent soft iron and 38 per cent hard iron to get 1.75 per cent silicon in the resulting iron.

The other point that must be worked out is what additions of the hard iron would have to be made to get the desired structure in the castings. You would have to consider more than just the silicon content since in melting steel rapidly and not allowing it to remain in contact with the coke, the carbon content may run as low as 2.50 per cent. Hence, in mixing the two irons not only the silicon is lowered, but the total carbon. Consequently, you see that there are a number of factors to be considered before you can proceed in melting two types of iron and mixing them. All of them must be considered in your arrangements.

NATIONAL WAR FUND

FOR OUR OWN - FOR OUR ALLIES

Several Compounds Used on Plaster

Q.—We shall appreciate information on the materials or compounds used as separating mediums in the construction of plaster patterns and coreboxes.

A.—According to information published by the Industrial Division, United States Gypsum Co., Chicago, the following separating mediums have been used quite generally for many years:

Stearic acid, or stearine and kerosene. The formula includes ¼-pound stearic acid shaved to flakes, 1 pint kerosene, 1 ounce aerosol O.T.100. Mix the ingredients and heat to the boiling point. Stir well. This medium is inflammable when subjected to too much heat. Proper precaution should be taken in its preparation. Apply to the pattern with a soft brush. Thin with kerosene if brush marks show. The thinnest film can be spread if the solution is warm. Aerosol keeps the stearic acid, an animal fat, and the kerosene oil in solution. This particular parting compound should not be used repeatedly on certain types of wet plaster as it is not compatible with these materials.

Petroleum jelly (vaseline) may be used if it is cut back with approximately 2 parts kerosene to 1 part jelly. The mixture is blended by heating and stirring. This material also is inflammable.

Lard oil may be used successfully if the pattern or model and room are warm at time of application. If room or model is cool, the lard oil will become too heavy and will not spread thin enough. Kerosene may be used as a diluent or cutting agent.

Light lubricating oil may be used if applied sparingly. Excess oil may cause separator runs and produce a soft surface on the gypsum cement model or pattern.

Carnauba or bayberry wax paste is made of equal parts by weight of wax and gasoline blended by heating. The mixture is inflammable. The solution may be applied warm to either a dry or moist gypsum cement pattern and then allowed to dry. After the gasoline has evaporated the wax is polished with a cloth to act as a sealer as well as a parting compound.

Potters or neutral potash soap—English soft soap—may be reduced to a thick lather and spread over the pattern with a sponge. All excess soap is removed with a clean sponge.

Spirits of camphor is the most successful separator for fine detail work, reproduction of jewelry, etc.

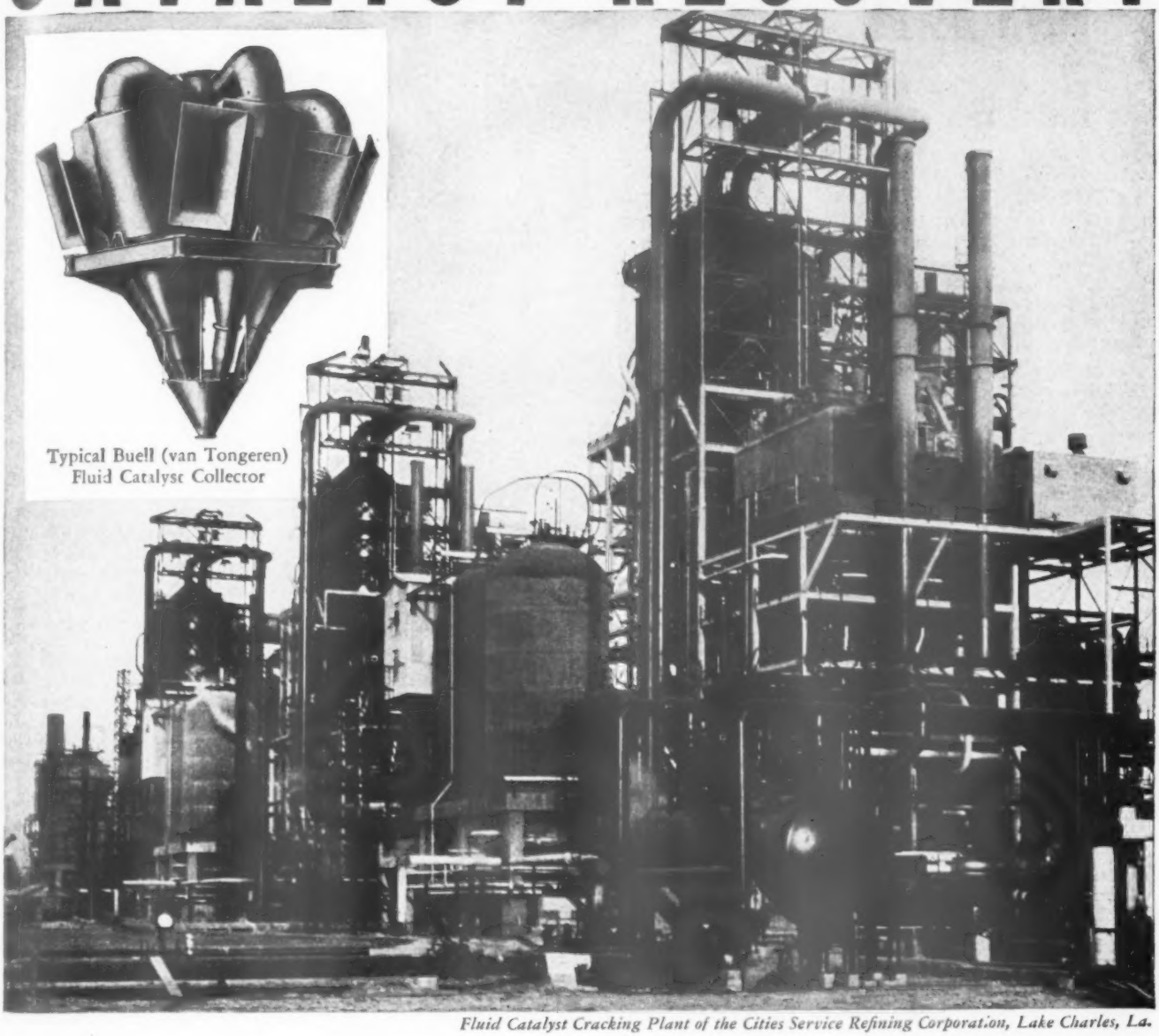
Gray Iron Grows with Repeated Heating

Q.—Have you any data on growth of gray iron, steel and malleable cast iron under repeated heating up to temperatures of 1350 degrees Fahr.?

A.—There is no reason to expect growth on repeated heating of malleable cast iron and steel in the range you mention. Cast iron does grow due to the replacement of graphite by films of iron oxide which wedge the iron apart. That goes on indefinitely except that as more and more of the oxide forms, it finally seals off the remaining metal from contact with the oxidizing gases. There also is a general belief that there is some oxidation of silicon to silica. Gray iron also grows because of conversion of combined carbon to free carbon, but that only occurs once for each conversion and finally stops.

We do not believe there are any quantitative figures about growth. All that can be said is that malleable iron and steel grow but little, if at all, and cast iron keeps on growing with each repetition of heating and cooling, and with extended exposure to high temperatures. You are cautioned that 1350 degrees is close to the critical point of maileable cast iron, and it may be converted into pearlitic malleable in use. If you go beyond the critical point the material on cooling, would no longer have its original physical properties.

CATALYST RECOVERY



Typical Buell (van Tongeren) Fluid Catalyst Collector

Fluid Catalyst Cracking Plant of the Cities Service Refining Corporation, Lake Charles, La.

Saving the Catalyst in High Octane Gasoline Production

• THE ABOVE ILLUSTRATION shows the plant of a large oil company, which is typical of the catalytic cracking plants used in the making of 100-octane gas. In this plant the fluid cracking process is employed.

An important part of the process is the Buell (van Tongeren) Catalyst Collector. Both the plant and the collector are representative of the type which have been installed by a number of oil companies making possible the production of tremendous quantities of gasoline required by the war program. Catalytic cracking is but one of the developments which point up the ingenuity and scientific progress of the American oil industry and by which high production of 100-octane gas has been possible.

Further, here is the strongest of indications of Buell's high efficiency and wide application. In designing and building over two-thirds of the nation's fluid cat-cracking capacity . . . The M. W. Kellogg Company has installed Buell catalyst recovery systems throughout.

Again, Buell has demonstrated its ability to solve difficult dust recovery problems.

Write for a copy of the illustrated book—"The van Tongeren System of Industrial Dust Recovery," containing facts about this patented system, interesting alike to engineer and executive.

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Sales Representatives in Principal Cities

buell
DUST RECOVERY SYSTEMS

DESIGNED TO DO A JOB, NOT JUST TO MEET A "SPEC"

MEN ... of Industry

CHARLES R. McGRAIL has become president of the Texaloy Foundry Co., San Antonio, Tex. For the past 12 years he was connected with the Steel Sales Corp., Chicago, since 1939 as manager of the company's nickel and ferroalloys department. Mr. McGrail received his metallurgical education at Carnegie Institute of Technology and for a time was with the foundry and metallurgical department of Fairbanks, Morse & Co. Later he became foreman with the Chevrolet Gray Iron Foundry, Saginaw, Mich., leaving there to go with the foundry division of the Struthers-Wells Titusville Corp., Warren, Pa. He joined the Steel Sales Corp. as metallurgist, working on the development of alloy cast iron.

♦ ♦ ♦

A. P. Lee has been appointed consultant to the Gray Iron Castings Section, Forgings and Castings Branch, Steel Division, War Production Board, to succeed **Edward G. Hoenicke,** who has returned to the Eaton Mfg. Co., Detroit. In May, 1942, Mr. Lee was loaned to the Bureau of Ships, U. S. Navy, by Bethlehem Steel Co. to serve as field consultant in the Forgings and Foundry Branch. He returned to Bethlehem a year later but has been called upon occasionally to perform special duties for the Navy. At Bethlehem Steel Mr. Lee has been foundry specialist in the pig iron sales department. He was born in Chelsea, Mass., in 1885, and has spent most of his business career in the foundry industry. Previous connections include Standard Foundry, Worcester, Mass.; Baldwin Locomotive Works, Eddystone, Pa.; Pusey & Jones Co., Wilmington, Del.; Sun Shipbuilding & Dry Dock Co., Chester, Pa.; and William Sellers & Co. Inc., Philadelphia. Mr. Lee left the Sellers company in 1934 to go with Bethlehem.

♦ ♦ ♦

E. K. Smith has been made specialist in metallurgy, of the Science, Education and Art Division, United States Department of State, and will be on detail to the National Resources of the Chinese government. For the past 2 years Mr. Smith has been connected with the Tank and Combat Vehicle Division, Army Ordnance Department, Washington, first as senior metallurgist and then as a major in the ordnance department. Prior to that he spent 11 years as service metallurgist, Electro Metallurgical Co., Detroit.

♦ ♦ ♦

O. L. Earl has been appointed vice president and a director of the Acme Aluminum Foundry Co., Chicago, in a sales capacity. For the past 18 years Mr. Earl was associated with the Mullins Mfg. Corp., Salem, O., and since 1937 as general sales manager. Before that he was connected with the Chrysler Corp., Gotfredson Corp., and the C. R. Wilson Body Co., Detroit. In 1942 and 1943 Mr. Earl acted in an advisory capacity to Brig. Gen. A. R. Glancy, chief of the Tank Automotive Center, Detroit. He also has served on industry advisory committees to both OPA and WPB.

♦ ♦ ♦

Earl Beyerlein has returned to the Hansell-Elcock Co., Chicago, as metallurgist. Mr. Beyerlein attended Purdue University and then was employed in turn by the International Harvester Co., Koppers Co., Hansell-Elcock Co., Hamilton Foundry & Machine Co., and the Kuhlman Electric Co.

♦ ♦ ♦

W. E. Carver has been made chief engineer of the Foundry Division, Reynolds Metal Co., Louisville, Ky. Mr. Carver formerly was connected with the Permanent Mold Division of the Monarch Aluminum Mfg. Co., Cleveland, serving as chief engineer and quality control manager.

♦ ♦ ♦

Millard J. Laugle has joined the Hillenbrand Industries, Batesville, Ind., where he will have charge of the experimental and ornamental modeling departments. He formerly was associated with the O. J. Shafer Pattern Works, Cincinnati, and the Acme Pattern Works, Dallas, Tex., as metal pattern foreman.

♦ ♦ ♦

Eugene M. Smith has been appointed to the staff of Battelle Institute, Columbus, O., where he will engage in research in nonferrous metallurgy. Mr. Smith was graduated from Lehigh University and attended University of Pittsburgh. He formerly was associated with Aluminum Company of America.

♦ ♦ ♦

Walter F. Morton has been made works manager of the foundry and factory divisions of the Anstice Co., Rochester, N. Y. Mr. Morton has been with the company since 1925, and formerly was factory manager and chief metallurgist. **Harold King,** appointed chief metallurgist, formerly was head of the metallurgical division of the engineering department, University of Rochester. Mr. King is secretary and treasurer of

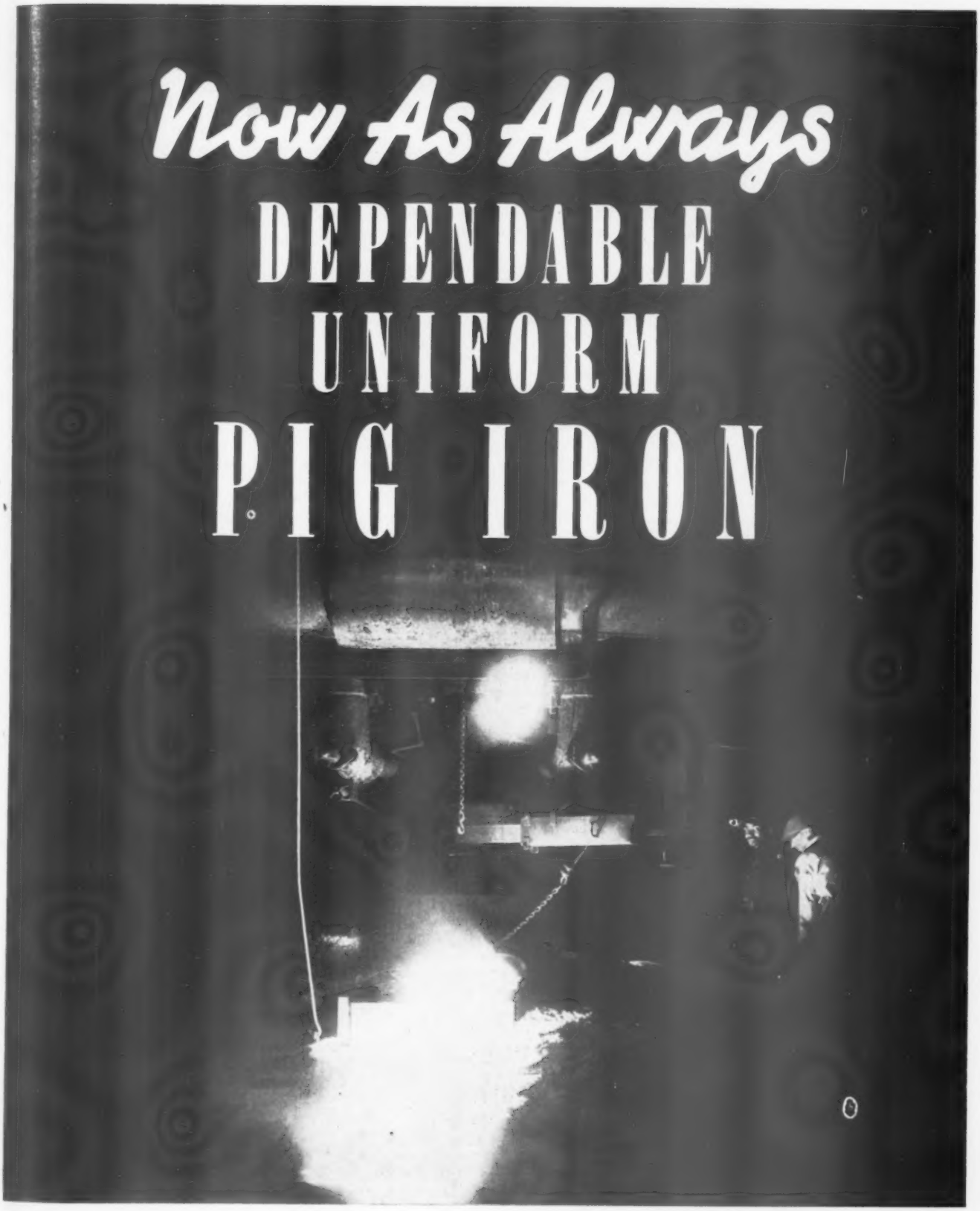
(*Continued on page* 96)

A. P. LEE

CHARLES R. McGRAIL

E. K. SMITH

O. L. EARL



WOODWARD IRON COMPANY
WOODWARD, ALABAMA

America's Largest Completely Integrated and Entirely Independent Merchant Iron Producer

INDEPENDENT SINCE 1883

(*Continued from page* 94)

the Rochester Section of the American Welding Society. **Frank M. Miller** will head the newly developed centrifugal casting department of the Anstice Co.

♦ ♦ ♦

Lloyd W. Hopkins, who has been associated with American Chain & Cable Co. Inc. for 21 years, has been appointed sales manager, Reading Steel Casting Division, Reading, Pa. Mr. Hopkins formerly served in research and engineering development, technical sales, sales engineering and recently as chief of priorities and contract termination for the company.

♦ ♦ ♦

E. E. LeVan has been elected president, Haynes Stellite Co., Kokomo, Ind., succeeding the late Francis P. Gormely. Mr. LeVan was graduated from Pennsylvania State College in 1917, and after spending 5 years as a mechanical engineer with Bethlehem Steel Corp., joined Haynes Stellite as a sales engineer. Since May, 1944, he had been vice president, general manager, and a director of the company.

♦ ♦ ♦

Reinhold D. Loesch, recently elected chairman of the Western New York Chapter of the American Foundrymen's Association, is president of the Lake Erie Foundry Co., Buffalo. Mr. Loesch was born in Buffalo and educated in schools of that city. In 1922 he entered the employ of Lake Erie Foundry Co., working in the various departments of the plant before becoming foreman in 1930. On the death of his father in 1938 Mr. Loesch became president of the firm.

♦ ♦ ♦

Wayne Martin, formerly assistant materials engineer with Sperry Gyroscope Co. Inc., has been appointed sales engineer for the National Smelting Co., Cleveland. A graduate of Purdue University, Mr. Martin at one time served as metallurgist with Beryllium Corp. of Pa. and with General Bronze Corp. He is chairman of the program committee of the Aluminum and Magnesium Division of the American Foundrymen's Association.

♦ ♦ ♦

Mason Britton recently was appointed assistant administrator, Surplus War Property Administration, Washington, where he will have general supervision over the disposal of all types of surplus property for which the Reconstruction Finance Corp. is the disposal agency. This includes industrial plants, machine tools and industrial equipment, chemicals, metals, minerals and other capital and producer goods. Mr. Britton formerly was vice chairman of the McGraw-Hill Publishing Co. Prior to Pearl Harbor he served 18 months as director of the Tools Division, Office of Production Management and WPB, and later was chairman of a task group of the Magazine and Periodical Section of the Printing and Publishing Division of WPB.

♦ ♦ ♦

Arthur Townhill has been made manager, Light Metals Division, Thompson Products, Inc., Cleveland. For the past 14 years he has been in the engineering and research department of that company. Prior to that he spent one year with the Aluminum Co. of America, specializing in piston development. Mr. Townhill is a member and past chairman of the Cleveland section of the Society of Automotive Engineers.

♦ ♦ ♦

Benton J. Sauppee has been appointed district sales manager of American Machine & Metals Inc. in the St. Louis district. Mr. Sauppee will supervise sales and service activities for the Troy Laundry Machinery, DeBothezat Fan, Riehle Testing Machine, and Tolhurst Centrifugal divisions of that company. Graduated from the University of Michigan, he subsequently became associated with Rochester Gas & Electrical Corp., Binghamton Light, Heat & Power Co., and Kentucky-Tennessee Light & Power Co. District offices have been established in the Arcade Building, Eighth and Olive streets, St. Louis.

♦ ♦ ♦

Dr. Donald B. Keyes has been appointed director of the Office of Production Research and Development of WPB, succeeding **Dr. Harvey N. Davis,** president of the Stevens Institute of Technology, Hoboken, N. J. Formerly head of the chemical engineering division, University of Illinois, Dr. Keyes has been with OPRD since its inception in November, 1942, as chief of the Chemical Industries Branch, and previously had served with the OPA and WPB in connection with matters relating to the chemical industry.

♦ ♦ ♦

R. T. Muench, formerly manager, Detroit x-ray office, Westinghouse Electric & Mfg. Co., has been appointed manager of the x-ray Products Department of the company. Mr. Muench attended Missouri University and Missouri School of Mines, and has been associated with Westinghouse since 1935. He formerly served with United States Engineers, Dick X-Ray Co., Engeln X-Ray Co., and Bauer & Black.

♦ ♦ ♦

Walter R. Hummel, controller, Campbell, Wyant & Cannon Foundry Co., Muskegon, Mich., has been elected president of the Western Michigan Control of the Controllers Institute of America. **W. H. Winter,** assistant secretary and assistant treasurer, Symington-Gould Corp., Depew, N. Y., has been re-elected secretary of the Buffalo Control of the national organization.

♦ ♦ ♦

William E. Kress has been appointed sales manager of the Middle West for Philco Corp. with headquarters in Chi-

(*Continued on page* 98)

LLOYD W. HOPKINS

E. E. LeVAN

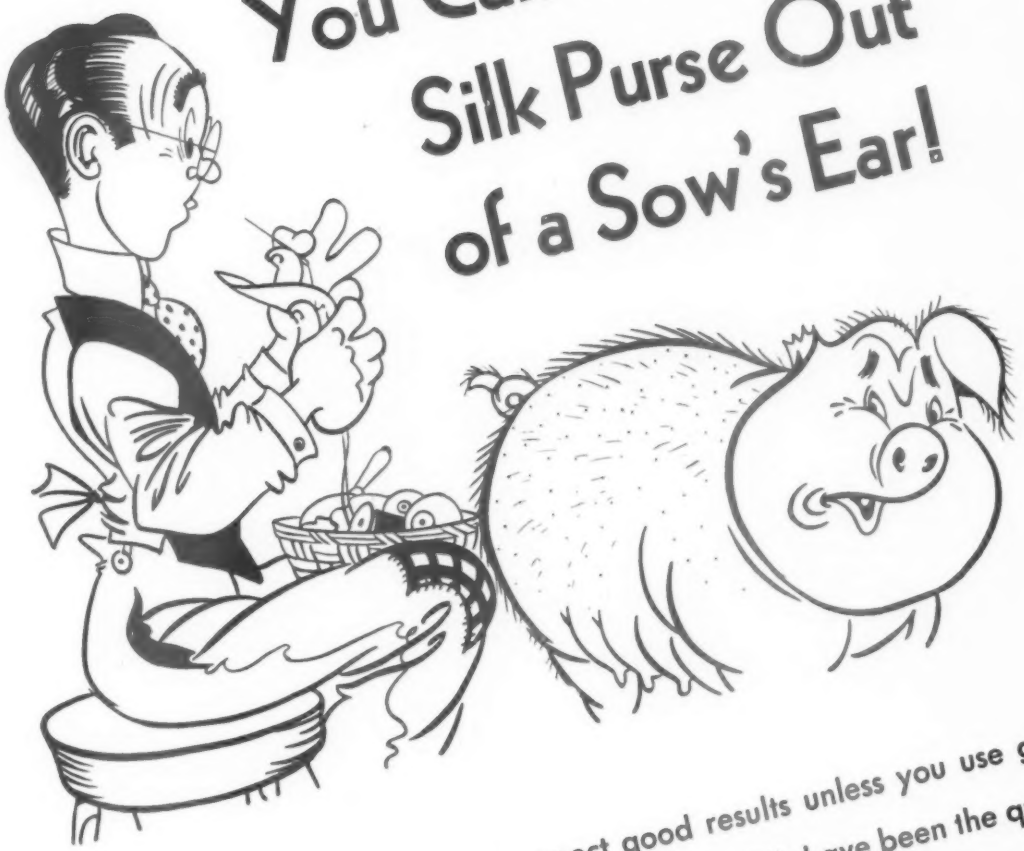
REINHOLD D. LOESCH

WAYNE MARTIN

THE LAST DROP IS AS GOOD AS THE FIRST

Ask the Men Who Use It!

You Can't Make a Silk Purse Out of a Sow's Ear!



. . . and you certainly can't expect good results unless you use good oils! For more than 20 years DAYTON Core Oils have been the quality leader. This unvarying uniformity is your assurance of better castings. Ask the Dayton Oil Service Man or write us direct.

The

DAYTON OIL COMPANY

DAYTON • OHIO

STEEL CORE AND MOLD WASHES • BINDER AND CORE PASTE • CORE WASHES • CHILL COATINGS

(*Continued from page* 96)

cago, succeeding **John M. Otter** who was made sales manager for the Home Radio Division of the firm. A graduate of the University of Illinois, Mr. Kress joined the firm in 1934. For the past 2 years he has been Southwestern Division manager with headquarters in Kansas City.

♦ ♦ ♦

William L. Hartley has been made assistant divisional manager for materials handling machinery, Link-Belt Co., Chicago, with headquarters at the company's plant in Philadelphia. Mr. Hartley entered the employ of the company as a draftsman in 1915, later served at Kansas City, Mo., and from 1931 to 1935 was district manager at Detroit.

Kennard F. Lange has been named to succeed Mr. Hartley as manager of central-division foundry equipment applications at the Pershing Road Chicago plant. Mr. Lange joined the company at the Dodge plant in Indianapolis in 1923, but in 1926 left to enter Purdue University from which he was graduated in 1930. For 7 years he was employed at the Ewart plant malleable iron foundry in Indianapolis. In 1937 he was transferred to Chicago to handle general engineering sales in Illinois.

♦ ♦ ♦

S. W. Fletcher, for many years executive vice president of the J. O. Ross Engineering Corp., has been elected president and will continue to make his headquarters in New York. **A. E. Montgomery** continues as vice president with headquarters in Chicago. Other officers of the company are: Vice presidents, **H. G. Rappolt** and **F. W. Partsch;** treasurer, **J. A. Ronder;** secretary, **R. W. Grott.**

♦ ♦ ♦

William J. Priestley has been elected president, Electro Metallurgical Co., Electro Metallurgical Co. of Canada, Ltd., Michigan Northern Power Co., and Union Carbide Co. of Canada, Ltd., all units of Union Carbide & Carbon Corp. He succeeds the late Francis P. Gormely. Mr. Priestley was graduated from Lehigh University in 1908, and entered the employ of Bethlehem Steel Corp. He became superintendent of the armor plate plant and subsequently was division superintendent in charge of all ordnance production for that company. During World War I he was civilian head of the Armor Plate and Ordnance Plant erected by the United States Navy. Later Mr. Priestley managed a steel plant making high-grade alloy metals for the automotive industry. In 1923 he became consulting metallurgist for Electro Metallurgical Co., and was made vice-president in charge of sales development in 1932. He was chief of the Alloy Steel Section of WPB during the period of organization for the expansion of alloy steel production in 1942.

♦ ♦ ♦

Harry Huff has been appointed superintendent of the Arizona Iron Works, Phoenix, Ariz. He has been in the foundry industry since 1927, first as a melter with the Duraloy Co., Scottdale, Pa., and later with the Forging & Casting Division, Allegheny Ludlum Steel Corp., Ferndale, Mich. Mr. Huff served as foundry superintendent of the latter plant from 1935 until his recent move to Arizona.

♦ ♦ ♦

Y. K. Leng has become associated with the Hiller Industries, Berkeley, Calif., in a training capacity, following a period spent with Aluminum Industries Inc., Cincinnati. Graduated from Nanyang College, Shanghai, Mr. Leng served in the plants of the Chinese Air Force about 5 years before coming to this country last year to obtain training in foundry practice.

♦ ♦ ♦

Charles L. Saunders has been made vice president of Wheelco Instruments Co., Chicago. Recently branch chief of the WPB Office of Civilian Requirements, Mr. Saunders previously was resident vice president at Chicago for the Minneapolis-Honeywell Regulator Co.

♦ ♦ ♦

C. Ralph Welles, for 12 years manager of the New York office of Hanna Furnace Corp., Buffalo, has been appointed eastern district manager of sales. **Carl A. Harmon,** formerly metallurgical engineer for Republic Steel Corp., Cleveland, has joined the Hanna company as chief metallurgist.

♦ ♦ ♦

Paul S. Gaston has been appointed deputy director of the Tools Division, WPB, succeeding **Franz T. Stone,** who resigned to join the Office of Strategic Services. Mr. Gaston, formerly with the Cleveland Tractor Co., Cleveland, has been associated with the Tools Division since January, 1942.

♦ ♦ ♦

Dudley Rice has been appointed a field engineer in the Chicago district for the Eutectic Welding Alloys Co. Mr. Rice recently was a sales specialist on welding products of the American Brake Shoe Co. and previously had been with the welding department of the Erie railroad's maintenance of way staff.

♦ ♦ ♦

Harold C. Osman, since 1935 sales manager of the Reading Steel Casting Division of the American Chain & Cable Co. Inc., Reading, Pa., has been appointed sales manager of the Crucible Steel Casting Co., Lansdowne, Pa.

♦ ♦ ♦

Edward L. Miller has been appointed manager of engineering, in charge of design engineering and research departments, for American Machine & Metals Inc., East Moline, Ill., to succeed **C. W. Anderson,** who was recently promoted to vice president and general manager of that company's new subsidiary, U. S. Gauge Co., Sellersville, Pa. Mr. Miller

(*Continued on page* 100)

KENNARD F. LANGE

WILLIAM L. HARTLEY

S. W. FLETCHER

WILLIAM J. PRIESTLEY

Save Casting time UP TO 50%

"Faster in all 3 Departments!"

1 GET FASTER FORMING!

Truline cores ram quickly, giving dense cores with freedom from sagging. *This means more cores per hour per core maker!*

2 GET FASTER BAKING!

Truline cores harden under low oven heat, dry without oxidation. Oven-time is less, output greater!

3 GET FASTER CLEANING!

Truline cores burn out readily. Core sand shakes out easily, saving valuable clean-up time.

IT'S A LOT OF SATISFACTION to turn out a big order of castings . . . every last one of them true to core dimensions, sound as a dollar! And it's mighty pleasant, too, to have them out on time . . . that certainly rings the bell with the Army, the Navy—whomever you're doing work for! Specify Truline Binder and watch your production climb! The coupon below brings complete information, use it today.

TRULINE BINDER

Reg. U. S. Pat. Off.

HERCULES POWDER COMPANY
INCORPORATED
999 Market St., Wilmington 99, Delaware

Please send ☐ sample ☐ information on how to use Truline Binder in casting:
(state type of work and kind of metal cast)

Name _____ Title _____
Company _____ City _____ State _____ NB-40
Address _____

(*Continued from page* 98)

formerly was assistant director of engineering and director of design for the company, which he joined in 1927, in Troy, N. Y., as design draftsman for the Tolhurst Centrifugal Division.

♦ ♦ ♦

Arthur Gordon Green has been appointed sales manager, Bay State Abrasive Products Co., Westboro, Mass. Mr. Green was associated with Norton Co., Worcester, Mass., for the past 28 years. After his graduation from Worcester Polytechnic Institute he entered the sales department of Norton Co. in 1917, was promoted to assistant district manager in Detroit where he remained 11 years, returned to Worcester for liaison work between laboratory and sales, became chief sales engineer, and, more recently, manager of engineering and service.

♦ ♦ ♦

Paul P. Bergmann has been made plant superintendent of the new West coast plant of Ampco Metal Inc., Burbank, Calif. Mr. Bergmann became associated with Ampco in 1934 as an apprentice melter at the parent plant in Milwaukee. Later he became purchasing agent, then night foreman in charge of the foundry, and finally supervisor of the centrifugal casting department.

♦ ♦ ♦

Earl McGee has been appointed works manager of the Renown Stove Co., Owosso, Mich. For the past 30 years Mr. McGee was affiliated with the Standard Gas Equipment Co., Baltimore, manufacturer of gas ranges.

♦ ♦ ♦

Dr. L. W. Eastwood, formerly vice president, Maryland Sanitary Mfg. Co., Baltimore, has joined the staff of Battelle Institute, Columbus, O., where he will engage in metallurgical research. Dr. Eastwood was graduated from the University of Wisconsin, served as assistant professor of metallurgy at Michigan College of Mining and Technology for 4 years, and as a research metallurgist for the Aluminum Co. of America for 7 years.

♦ ♦ ♦

Prof. Carl E. Schubert has joined the Certified Core Oil & Mfg. Co., Cicero, Ill., as manager. For the past 18 years Mr. Schubert was assistant professor of mechanical engineering at the University of Illinois where he instructed in

CARL E. SCHUBERT

pattern design and foundry practice. He is the author of the text book, *Foundry Practice,* as well as bulletins and articles dealing with the technical side of core mixing. Mr. Schubert was graduated from Notre Dame University as a chemical engineer and is chairman of the Committee on Durability of Molding Sands of the American Foundrymen's Association.

♦ ♦ ♦

W. G. Frank has been made assistant to the president, American Air Filter Co., Louisville, Ky., in connection with sales. **H. C. Murphy,** vice president, has been appointed general sales director; **John Hellstrom,** vice president, continues as head of the Dust Control Division; **Howard W. Pound** has been placed in charge of the Air Filter Division, and **William K. Gregory** will direct the Special Products Division.

♦ ♦ ♦

Dr. Walter M. Mitchell has been appointed director of research, Mack Trucks, Inc., New York. Previously he was chief metallurgist for the special ordnance plant of the York Safe & Lock Co., metallurgical engineer with Carnegie-Illinois and other U. S. Steel subsidiaries, as well as Republic Steel Corp. He is a graduate of the University of Pennsylvania and received his doctorate from Princeton University.

♦ ♦ ♦

Donald W. McGill has been appointed manager of the machinery electrification section of the industrial department, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. He succeeds **L. F. A. Mitchell,** who has returned to the Canadian Westinghouse Co. as assistant to the president. Mr. McGill has been associated with Westinghouse since 1933.

♦ ♦ ♦

William C. Seccombe, long associated with the late George William Finegan, who represented the Kelley-Koett Mfg. Co., Covington, Ky., in northern New York, has been elected president of George William Finegan Inc. The organization will continue as Kelley-Koett representative.

♦ ♦ ♦

Charles B. Molloy, for the past 6 years general sales manager, General Blower Co., Chicago, has become associated with Power Engineering Co., Chicago, as a partner.

♦ ♦ ♦

Guy E. Hairston has been appointed manager of the Atlanta district sales territory for American Machine & Metals

(*Concluded on page* 102)

ARTHUR GORDON GREEN

PAUL P. BERGMANN

EARL McGEE

DR. L. W. EASTWOOD

LET'S RING IT AGAIN!

Every Sterling Grinding Wheel we make is dedicated to limitless progress in a free, unshackled America.

Someone has said that liberty never seems so important as when it is far away. On lonely, distant battlefronts, our men talk of home. They remember their country as they left it and the memory is good. But, they cannot forget those who would change our established order of doing things . . . who still seem to feel the way to advance individual initiative is to strangle it with planned economy and unnecessary regulation.

No serviceman expects his country to be the same as he left it. He expects progress! He has a right to assume that any changes made at home will be for the better—that he can return to a life that has not been altered by a system of dubious value, promising only future hardship and depression.

The American people have a most important duty to perform for the boys across the seas. We have stood up under many kinds of shortages, but we cannot permit a priority to exist on good, old-fashioned American opportunity! If a returning veteran wants to start in business for himself, he should not be repelled by fear of excessive taxation. He should not have to ask anyone where or how long he can work. If he needs help, it should be given him without paternalistic pats on the head by anyone. He wants to enjoy the freedom for which he fought!

The democratic principles of our forefathers were set fourth in the Constitution and the Declaration of Independence. They have withstood the test. It is for these principles young America goes to war, and Young America expects those principles to remain intact while they are gone.

The Liberty Bell—let's ring it again!

• STERLING ABRASIVES •

THE STERLING GRINDING WHEEL DIVISION
OF THE CLEVELAND QUARRIES COMPANY
TIFFIN, OHIO

THE WHEELS OF INDUSTRY

(*Concluded from page* 100)

Inc., East Moline, Ill. A graduate of Vanderbilt University, Mr. Hairston recently was southeastern district sales manager for the American Radiator & Standard Sanitary Corp.

♦ ♦ ♦

Allyn H. Noelke has been appointed executive secretary, American Washer and Ironer Manufacturers' Association, effective June 1, with office at 111 West Washington Street, Chicago. He succeeds **W. Neal Gallagher,** president and general manager, Automatic Washer Co., Waterloo, Iowa, who took over the post upon the death of Joseph R. Bohnen in January, 1942. Mr. Noelke recently had been with OPA at Chicago, and previously had been general manager, Paramount Electric Supply Co., Chicago, and manager of the specialties division, American Can Co., New York.

♦ ♦ ♦

Harry W. Gray has joined Manning, Maxwell & Moore Inc., Bridgeport, Conn., to engage in product development and field research work. He had been assistant to the general sales manager of the Airtemp Division of the Chrysler Corp., Dayton, O.

♦ ♦ ♦

Thomas W. Pettus, since 1943 vice president in charge of sales of the National Bearing Corp., St. Louis, has beeu named executive vice president of that company, succeeding the late Damon de Bois Wack.

♦ ♦ ♦

H. O. Teeple, chemical engineer, has joined the technical service group of the Development and Research Division of the International Nickel Co. Inc., New York. He will specialize in corrosion problems.

♦ ♦ ♦

Winfred L. Foss has been appointed manager of the Boston district sales territory of American Machine & Metals Inc., East Moline, Ill. Mr. Foss previously was regional sales manager for the Douglas T. Sterling Co.

♦ ♦ ♦

F. T. Turner has been promoted to assistant sales manager of the brush division of the Osborn Mfg. Co., Cleveland. He has been associated with the company since 1932.

♦ ♦ ♦

A. B. Johnson has been named plant manager of the Cleveland Pneumatic Tool Co., Cleveland. He has been with the company 28 years and recently was master mechanic.

♦ ♦ ♦

Alan D. Dauch, vice president of the George J. Hagan Co., Pittsburgh, has been elected president of the Industrial Furnace Manufacturers' Association.

GRAY IRON FOUNDERS

Plan Annual Conference

GRAY IRON foundry management will preview after-Victory prospects and the industry's postwar role and blueprint plans for peacetime production at the sixteenth annual and first Peacetime Preparation Conference of the Gray Iron Founders' Society to be held at the Netherland Plaza hotel, Cincinnati, Oct. 10-11.

"If the gray iron castings industry is to play fully and effectively its basic role in the establishment of a stable, prosperous postwar economy, it must, in the very near future, implement very definite and workable plans for a high level of peacetime, profitable production, and the society's 1944 annual meeting is designed to assist management to look ahead to peacetime prospects and problems and to set up postwar programs," W. W. Rose, the association's executive vice president, pointed out.

The two-day meeting, patterned after the society's successful conference in Cincinnati last year, is intended to bridge, in projection, whatever then remains of the steadily narrowing time-gap between gray iron castings production for war and gray iron production for peace; also to discuss transition-period problems, dependent industry reconversion, and postwar conditions and planning.

Problems of the transition period, including contract termination from the subcontractor's viewpoint, the probable postwar atmosphere, and the gray iron industry's prospects and possibilities in an economy of "deferred demand" are scheduled for detailed examination in the first session of the conference which opens at 9:30 the morning of Oct. 10. Registration will begin an hour earlier.

Walter L. Seelbach, secretary-treasurer of the Forest City Foundries Co., Cleveland, and president of the society, who will preside at the general conference sessions and the business meeting, will deliver the annual address of welcome and stress the importance on the part of the gray iron industry of immediate planning for increased peacetime productivity. A speaker of national reputation will give further emphasis to the demand-to-be-met theme at the luncheon session.

In the afternoon of the first day, following discussion of the sound operation fundamental of sound costing, the conference will swing, according to tentative plans, into what is expected to be one of the highlights, an informational panel on technical problems with members of the society's Technical Committee forming an "Information, Please" panel. In brief discussions committee members will review outstanding wartime-developed techniques, examine those of the industry's technical developments most likely to influence future markets, project postwar technical problems and suggest directions for postwar technical research. The session will then be thrown open for questions from and discussion by the floor. Edward L. Roth, president, Motor Castings Co., Milwaukee, is chairman of the society's Technical Committee and will head the panel.

Discussions of mechanization from the production and labor relations viewpoints, of intelligent, practical plans for marketing castings as engineering components, and of co-operative effort in technical research, sales promotion and market determination will fill the first session of the second day, with W. W. Rose, executive vice president of the society, on the program.

The second luncheon session of the meeting will also feature a nationally known speaker and the general sessions will conclude with a talk on management-labor relations.

At the business session the society will hear the reports of its officers and committee chairmen and elect directors to succeed those whose three-year terms have expired. The society's directors will meet immediately after the close of the business session, the final session of the conference, to elect officers for the ensuing year.

Battelle Receives Ordnance Award

The Ordnance Distinguished Service Award has been granted by the War Department to Battelle Memorial Institute, Columbus, O., for outstanding contributions to ordnance progress during the course of the war. The institute has been actively engaged in research for the Ordnance Department, Bureau of Ships, Army Air Corps, Watertown Arsenal, War Production Board, Defense Plant Corp., Office of Scientific Research and Development, National Defense Research Association, National Academy of Science, and others.

Apprentice Training Booklet Issued

"Evaluating Apprentices", a 20-page booklet for training directors and those responsible for apprentice training, has been prepared by the Apprentice-Training Service, Bureau of Training, War Manpower Commission, Washington. The booklet includes technical advice on how to determine cost of training apprentices, as compared with the value of their production while in training and how to record the skills apprentices acquire in advancement during their training.

Just Announced!

REVOLUTIONARY NEW "PHILCO THIRTY" GIVES 30% LONGER LIFE!

Again . . . Philco Makes Engineering History

At last, a motive power battery with a revolutionary, new construction that actually gives you *30% longer life . . . and more!* A brand new principle of fabricated insulation . . . developed after years of research in the Philco laboratories, and now introduced after exhaustive tests in actual service. It's the *Philco "Thirty"* . . . your post-war battery, available now in certain types and limited quantities. Write today for full information.

PHILCO CORPORATION, *Storage Battery Division, Trenton 7, New Jersey*

FOR 50 YEARS A LEADER IN INDUSTRIAL STORAGE BATTERY DEVELOPMENT

SPO's · FAST CO-WORKERS ON MANY VARIED JOBS

SPO No. 100 Series Jolt Squeezer Machines, CANTILEVER Type.

SPO No. 200 Series Jolt Squeeze Stripper Machines, CANTILEVER Type.

SPO No. 300 Series Jolt Stripper Machines.

SPO No. 500 Series Jolt Rockover Draw Machines.

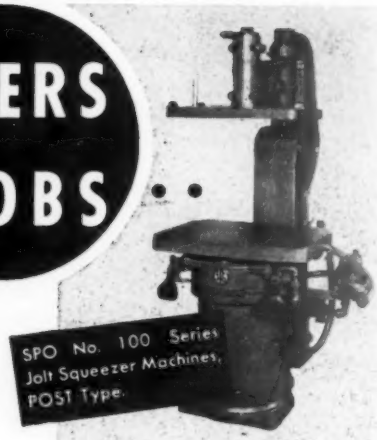
Beginners catch on "in no time"

"Place flask—fill with sand—press lever — remove finished mold. That's about all there is to it. In a few hours beginners are turning out good molds and a lot of 'em." So speaks a user of SPO Molding Machines.

That pleasing remark is typical. Perhaps the biggest reason for such speed-in-a-hurry is SPO's extreme simplicity of design—a feature which, incidentally, cuts maintenance to a negligible factor.

Another advantage. SPO Molding Machines can be paired up to show a better profit. For example: you can combine either the No. 200 or No. 300 series with the No. 500 series, or double up in numerous other ways.

Each machine on this page stands for a whole series. Call upon our many years' experience as practical foundrymen to give you the *best possible equipment* for your purpose.



SPO No. 100 Series Jolt Squeezer Machines, POST Type.

SPO No. 200 Series Jolt Squeeze Stripper Machines, POST Type.

SPO No. 400 Jolt Squeeze Rockover Draw Machines.

Bulletins showing capacities of all these machine series are available upon request.

SPO

INCORPORATED

Manufacturers and Specialists in Molding Machines, Vibrators and Patterns for Production

7500 GRAND DIVISION AVENUE · · · · CLEVELAND 5, OHIO

Adjusting Wages in the Foundry

Restrictions on wages that may be paid foundry workers are not inflexible. The accompanying article, prepared by the National War Labor Board, points out various alternatives the foundry operator should explore before despairing of adjusting his wage structure to wartime conditions.

THE ALLIED armies are forging ahead everywhere—in France, in the Pacific and in Italy. We are on the brink of delivering the knockout blow and cannot afford to be bogged down for lack of vital materials. Crucial shortages today are anticipated in forge and foundry products unless prompt remedial action is taken. The War Department is demanding almost ten times as many heavy trucks as it did in 1941. Increased deliveries of castings for B-29 plane production are just as urgent.

Unless our foundries and forge shops can find the manpower to turn out these vital goods, victory may be delayed while our fighting men are held back for lack of vital equipment. Castings and forgings are the backbone of modern warfare —essential in the air and on the ground. The trucks, tanks and planes we must have cannot be produced unless the bottleneck in the foundries is broken.

With the Army and Navy demanding greater production on one hand and a shortage of foundry manpower on the other, the forge shop and foundry operator may feel that much of his difficulty is due to restrictions on the wages he can pay to attract workers. The sort of restrictions that make it impossible to offer wages which will bring enough workers to jobs that are "hot, hard and dirty." If these restrictions meant that wages were frozen, this attitude might be justified. But wage stabilization does not mean freezing wages.

Several Alternatives Available

The foundry operator, along with other employers, has a number of alternatives he should explore before he despairs of adjusting his wage structure to wartime manpower and price conditions.

The National War Labor Board, charged with stabilizing wages, already has moved to help him meet the urgency of the problem. A co-ordinated program was adopted by the board in conjunction with other government agencies which are responsible for meeting production and manpower problems. The program is designed to help cure the manpower shortage in the gray iron, malleable iron and steel foundries.

The National War Labor Board has ordered its Regional Boards to determine approvable rates for "foundry labor" distinct from "general common labor or common labor in metal working industries."

Then in setting up this program with other government agencies to break the bottleneck in the foundry industry—a bottleneck which could seriously hinder the prosecution of the war—the 12 Regional Boards throughout the country were ordered to follow the program outlined below:

1. All voluntary and disputes cases involving gray iron, malleable, and steel foundries are to be processed immediately. In these cases of complicated issues, it is suggested that interim orders should be issued with the most acute aspects of these cases, particularly those relating to the wage rates for foundry labor and closely related occupations.

2. In areas where no approvable brackets have been set up, these should be determined for foundry labor as distinct from general common labor or common labor in metalworking industries. Foundry brackets should be based on the rates now paid in foundries and should take into account that traditionally foundry labor has been paid somewhat higher than is usually paid for common labor in most other industries. This is due to the fact that work in foundries is heavy, hazardous, and offers little chance for promotion.

3. In determining foundry brackets and in processing foundry cases, attention should be paid to the avoidance and correction of inequities in the rates of classifications involving approximately the same degree of skill.

4. Employers and unions interested in the establishment of sound incentive plans in foundries should be advised that they can get assistance in the development of such a plan from the War Production Board.

5. Production agencies of the government will report to the National War Labor Board all foundry cases which they consider as being particularly necessary of speedy action. Such cases as are deemed to be "rare and unusual" by these production agencies will be handled in the usual manner by the War Labor Board.

This special program was set up to take care of a particularly urgent situation. We cannot, however, overlook the fact that wage stabilization is necessary if the country is to prevent disastrous inflation. There are other regulations under which an employer may make wage adjustments whether with or without War Labor Board approval.

To meet the needs for controls which would stabilize the general level of wages and at the same time permit correction of inequities among low wage workers or those whose pay had lagged behind the general upswing, the program defined by Congress and the President authorizes the board to approve increases in the following circumstances:

1. **General wage increases related to the cost of living and limited to the 15 per cent permissible under the Little Steel Formula.**
2. **Voluntary increases to correct substandards of living up to 40 cents an hour.**
3. **Increases to correct inequities in rates paid for similar work in various plants of the same community. Raises may be given up to the minimum of what the regional War Labor Boards have found to be "sound and tested" rates paid for a particular job in an area and industry.**
4. **In rare and unusual cases affecting prosecution of the war, the board may grant increases above the minimum of sound and tested rates. Such increases are rarely granted and a showing must be made that critical war production cannot otherwise be obtained.**
5. **Increases to correct inequities in the wage structure of a single plant may be made through reclassifications, promotions, merit or service schedules, or through production incentives. Such increases are always subject to the limitation that they must not increase the level of production costs appreciably or furnish the basis either to increase prices or to resist otherwise justifiable reductions in price.**

To illustrate increases approved by the board to remove intra-plant inequities, there is the decision made on Jan. 18, 1944, involving the employes of the Warner Gear Division of the Borg-Warner Corp.

A recommendation was made that the company with the co-operation of the union involved analyze its present incentive system covering production work-

(*Continued on page* 170)

around DETROIT

BY A. H. ALLEN
Detroit Editor,
The Foundry

Special committee seeks development of "reasonable repair procedure" following withdrawal of directive issued by Chief of Ordnance covering welding repairs to cylinder blocks and heads. . . . Standardization of shot and grit sizes studied by S.A.E.

REPAIR of defective gray iron castings by welding is nothing new to automotive foundrymen, for many of them have been practicing it for 30-odd years, and it has come to be a routine procedure. However, in recent weeks the subject has become intensely "hot," most of the heat being generated by a directive (Engineering Bulletin No. 152) issued by the Office of the Chief of Ordnance, Detroit, covering such repairs on cylinder blocks and heads used in ordnance equipment.

This directive, since withdrawn pending further clarification of the question, virtually restricted any type of welding for repair of these castings. Among other things, it proposed that a diagram showing the type of repair in each area be furnished, along with details of the repair process, including: Method of cleaning up the defect, welding process, type of electrode or rod and analysis, type and make of flux, degree of pre-heat and post-heat, and method of cooling. Other requisites include a statement that individual repairs are to receive prior approval of the resident inspector, a hardness survey and photomicrograph of a typical weld, heat affected zone and base metal, records of number and type of repairs, etc.

Discuss Various Factors

Discussions are being held regarding repairs for purposes of improving surface appearance in areas subject to friction, in areas subject to exhaust gases, or repairs for general porosity and for cracks or casting breakage. Repairs are to be made on cylinder blocks prior to machining and it is specified that castings are to be preheated to a minimum of 900 degrees Fahr., maximum of 1100 degrees, and welded using gray iron rods, oxyacetylene torch and a suitable flux or, where plugging is to be used, drilling out the defect, tapping the hole and plugging, using a threaded gray iron plug and a sealer on the thread.

Caution of course is commendable when it is based on the consideration of saving lives to combat forces in the field, but realistic analysis will show that to a certain extent the proper repair of gray iron castings by welding cannot conceivably be the basis for failure of equipment in the field, and that any misunderstanding of the previously-mentioned directive might prove to be a serious stumbling block to the flow of automotive war materiel.

Seeking to develop a sound approach to the problem, interested foundrymen and engineers have organized a special committee of the War Engineering Board of the Society of Automotive Engineers, including representatives of the motor companies, two large independent gray iron foundries and delegates from the American Welding Society and the American Foundrymen's Association, to cooperate with the OCO in clearing up any doubtful points regarding Bulletin 152. Chairman is L. A. Danse of the manufacturing staff of General Motors Corp. and for many years chief metallurgist of Cadillac. The committee is moving fast toward the development of a "reasonable repair procedure," and results of its deliberations should be available to industry and the procuring services before long.

Has Its Limitations

Meanwhile the General Motors Corp. foundry committee has held active discussions of the subject, and its ideas have been passed along to the WEB committee. The Cadillac Division has had a specified gray iron castings welding procedure in effect for the past 12 years, and this has served as a basis for the new discussions. Some modifications, amplifications and clarifications doubtless will be effected in any new procedural recommendations.

The whole subject of welding for repair is a little touchy and there are many shades of opinion, ranging all the way from complete abhorrence of the practice to general acceptance. The attainment of some middle ground is now the goal. It does appear the consensus that in the areas of castings subject to high pressure, high stress or high heat, welding repair should not be recommended.

* * *

RETIREMENT of Hugh Martin from the presidency of Detroit Gray Iron Foundry Co. and its affiliated Detroit Alloy Steel Co., pioneer producer of automobile body dies and other heavy castings, has been announced. Mr. Martin has not disclosed his future plans nor has the company management made any announcement as to his successor. In recent months several other key executives of the company have left for other positions. H. F. Kluender, at one time general manager, reportedly is now associated with a new foundry at Chelsea, Mich.

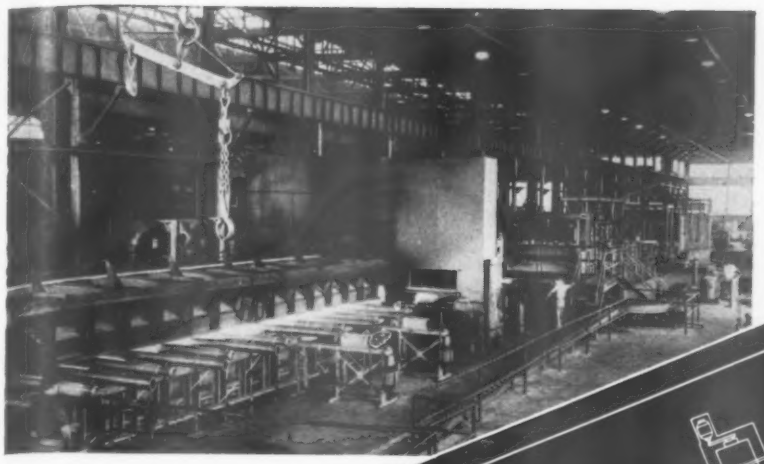
Wilson Foundry & Machine Co., Pontiac, Mich., is in the final stages of an expansion and modernization program undertaken in connection with war production demands. Some observers read behind the program the impetus of C. E. Sorenson, former Ford executive now head of Willys-Overland, who has always been a strong proponent of castings in automotive applications. Control of the Wilson foundry is interlocked with that of Willys-Overland through the Empire Securities Corp. and Wilson can logically be expected to be the castings source for Willys when the latter returns to automotive production.

Producing Gray Iron

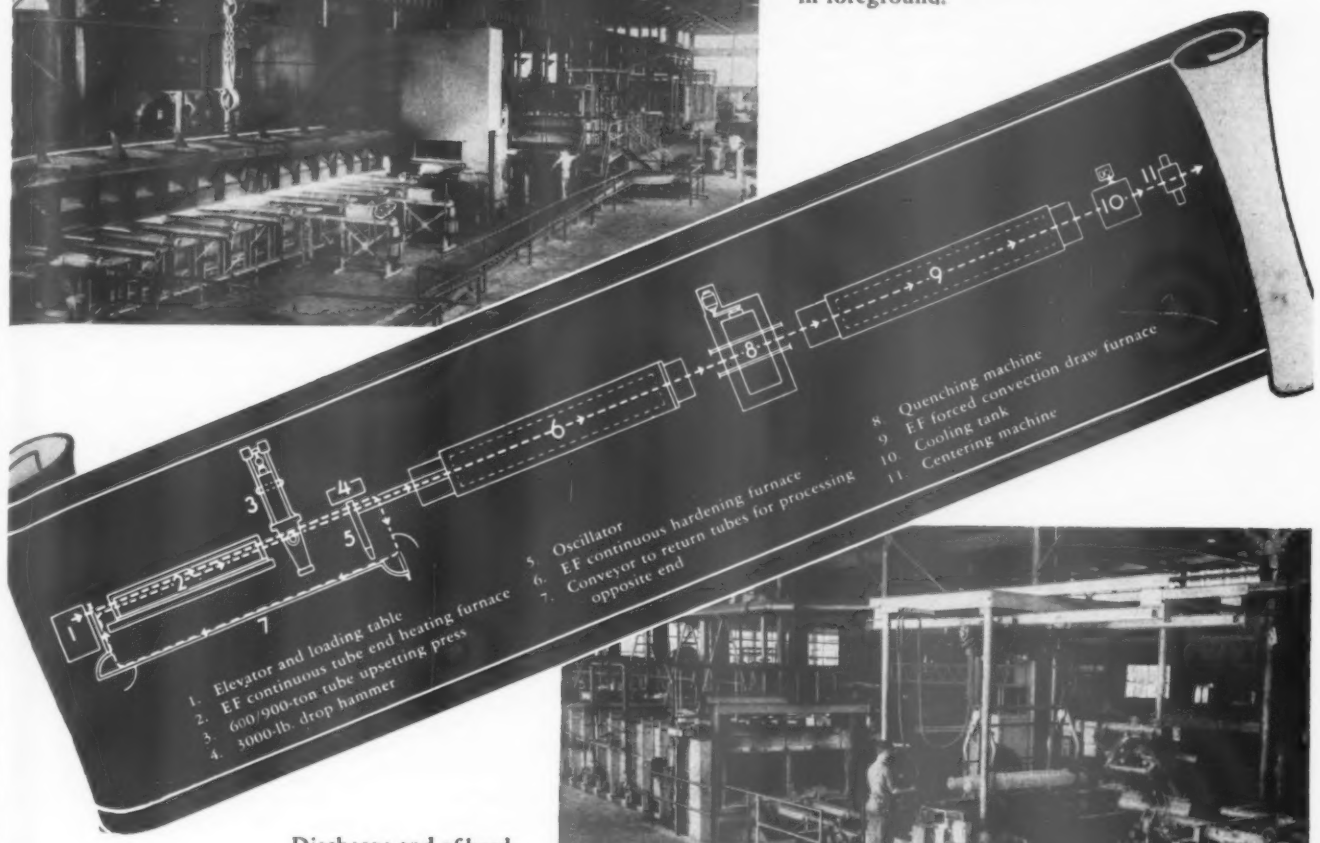
R. H. McCarroll, for a number of years head of metallurgical activity at Ford Motor Co., and responsible for most of the strides made by Ford in perfecting the production and application of centrifugal castings and other new foundry methods, now is understood to be director of all engineering activity for the Dearborn producer. Although no official announcement has been made, it is known that Mr. McCarroll for several months has been drawing up organizational charts for engineering staff activity and in general being engaged outside the purely metallurgical phase of his former work.

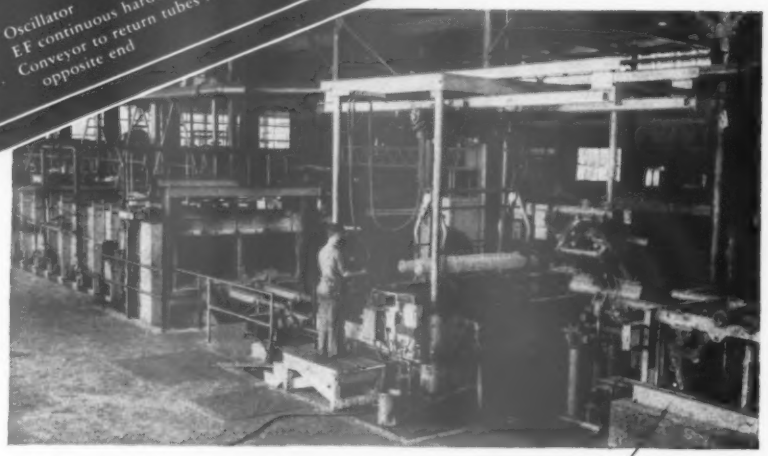
Two more automotive gray iron foundries are returning to production on a limited basis. The Nash foundry at Kenosha, Wish., is tapering off its aluminum cylinder head production and switching over to some gray iron, while the Cadillac foundry in Detroit has undertaken production of castings for J. I. Case on a subcontract basis. The Packard foundry, which will return to iron production this fall, likely will be turning out a

(*Concluded on page 108*)



This view shows the complete automatic installation with the end heating furnace in foreground.


1. Elevator and loading table
2. EF continuous tube end heating furnace
3. 600/900-ton tube upsetting press
4. 3000-lb. drop hammer
5. Oscillator
6. EF continuous hardening furnace
7. Conveyor to return tubes for processing opposite end
8. Quenching machine
9. EF forced convection draw furnace
10. Cooling tank
11. Centering machine



Discharge end of hardening furnace and charging end of draw furnace with automatic quench between.

EF Furnaces are Important Units in

Producing the New Tubular R.R. Axles

. . . by continuous production line methods

In the Pittsburgh Steel Company's modern plant for producing the new tubular railroad axles; the upsetting press, the drop hammer, three continuous automatic furnaces, quenches, straightener and other equipment are all tied in together, in one complete continuous straight line production unit.

EF furnaces are playing an important role in this outstanding installation. An EF continuous gas fired end heating furnace and automatically controlled EF hardening and drawing furnaces are providing the accurate heating cycles specified for producing the exact physical characteristics required by the producers of these new tubular axles.

This is just another example of how EF engineers are qualified to cooperate with industry in designing and building dependable production heat treating equipment for new and unusual applications and developments.

Submit your production furnace problems to EF engineers. It pays.

The Electric Furnace Co., Salem, Ohio

Gas Fired, Oil Fired and Electric Furnaces---For Any Process, Product or Production

(*Concluded from page 106*)
greater tonnage than originally anticipated. Virtually a complete reconversion to gray iron is in the making, and production will be concentrated on service castings together with some outside requirements. Chevrolet Gray Iron now is about the only automotive gray iron plant not back into production.

• • •

LOCAL foundry of Johnston & Jennings Co., which has operated one 5-ton per hour cupola on white iron for many years, producing sash weights and a miscellaneous line of other castings, has been taken over by the Clayton Sherman Abrasive Co. and will be in production shortly on shot and grit for blasting work. In recent months, the plant has been producing milling stars but increasing labor costs reacted to make this a steadily less profitable venture so it has been abandoned. Milling stars are reported to be a scarce commodity, but at a price of something under $100 a ton, and with a good many thousand of them per ton, their production is not exactly a money-maker. Price relief seems the only answer.

Standardization of shot and grit sizes is a project commanding the attention of a committee of the Society of Automotive Engineers, and a tentative classification has been drawn up for approval. It lists all the various makes of shot and grit and divides them into eight or ten groups, according to screen size. Final adoption of the standard should go a long way toward simplifying the specification of this material. The need for such standardization was becoming imperative with the steadily expanding use of shot and grit blasting, both for cleaning castings and for "shot peening" of metal parts to improve fatigue properties.

• • •

ODDS AND ENDS: Joseph W. Frazer, once more returned to Detroit as chairman of the board of Graham-Paige and its newly acquired subsidiary, the Warren City Mfg. Co., Warren, O., says the company shortly will be readying plans for postwar automotive and farm implement production, and likely will build its own engines . . . . Pontiac foundry currently is pouring something over 200 tons of gray iron daily . . . . Man-effort, the generally accepted term to indicate productivity of workmen, has fallen off in Detroit area foundries from 10 to 50 per cent in comparison with prewar levels . . . . Percentage of negro workers in foundries here ranges as high as 85 per cent in one large plant, with others in the neighborhood of 50 or 60 per cent . . . . One foundryman in this district says that in hiring new help, it is the practice to add up the prospect's arms and legs and if the total is between two and four he is hired . . . . A superintendent, in telling of his fatal mistake years ago in allowing a thermometer to be installed in his shop during the hot weather season, says that his policy now on blistering days is always to don his coat before taking a stroll through the plant. Effect on the sweating workmen is miraculous, he adds.

A. C. Williams Co. 100 Years Old

A. C. Williams Co., Ravenna, O., manufacturer of light gray iron, semi-steel and magnesium castings, and hardware, is celebrating its one hundredth anniversary this year. In observance of the event the company has published an attractive brochure containing a history of the organization, views of the original and present plant and illustrations of various products manufactured during the past century.

When John W. Williams started the company in 1844 in Chagrin Falls, O., supplies were hauled by team from Cleveland, 18 miles away. Flat irons and stoves were among the company's leading products in its early days, and at one time it was the largest manufacturer of iron toys in the world. In 1855, Mr. Waterman, who had been a partner of Mr. Williams, retired, and in 1872 Mr. Williams took his son, A. C. Williams, into partnership. The latter bought the business outright in 1886, the year of his father's death, and in 1892 moved it to Ravenna, O. In 1905 the business was incorporated and J. H. Bigalow came from Cleveland to become treasurer and assistant general manager.

A. C. Williams gradually gave up active work in the company and in 1919 he and his son, J. W. Williams, retired and sold their interests. Present officers are: President, J. H. Bigalow; vice president and manager, C. A. Heisler; secretary and assistant manager, Thomas Fletcher; treasurer and production manager, J. B. Heisler. The company now is actively engaged in the production of iron and magnesium castings for half-tracs, jeeps, landing craft, airplane engines, and other war items.

Many To Exhibit at Metal Congress

According to William H. Eisenman, national secretary, American Society for Metals and managing director, National Metal Congress, some 300 manufacturers and organizations serving the metal industry have broken a 26-year record for advance reservations of display space at the National Metal Congress and War Conference Displays.

The Metal Congress, scheduled for the week of Oct. 16 at Public Hall, Cleveland, is sponsored by the American Society for Metals in co-operation with the American Welding Society, Iron and Steel and Institute of Metals Divisions of the American Institute of Mining and Metallurgical Engineers, American Industrial Radium and X-Ray Society, and Society for Experimental Stress Analysis.

Technical sessions of the various organizations will be held each morning, afternoon and evening during the congress with nearly 1000 metal experts collaborating in presentation of some 150 lectures. In addition to technical reports on research developments of the past year, American Society for Metals will present a series of panel-type production meetings each afternoon and evening with the exception of Thursday evening when the annual dinner will be held.

Monarch Engineering Acquired by Fisher

Fisher Furnace Co., 5519 North Wolcott avenue, Chicago, has purchased the industrial furnace business of the Monarch Engineering & Mfg. Co., Baltimore. Through this transaction the Fisher Furnace Co., acquires the right to manufacture Monarch equipment, and obtains all patterns, drawings and parts inventories.

Future plans provide for the continued manufacture of certain specialized Monarch furnaces with improved design features, and the continuation of a complete parts service for those furnaces now in operation. All Monarch furnaces carried into the line produced by the Fisher Furnace Co. will be thoroughly revamped and modernized. Combined headquarters and manufacturing facilities will be located for the present in the two existing Fisher plants in Chicago.

Book Review

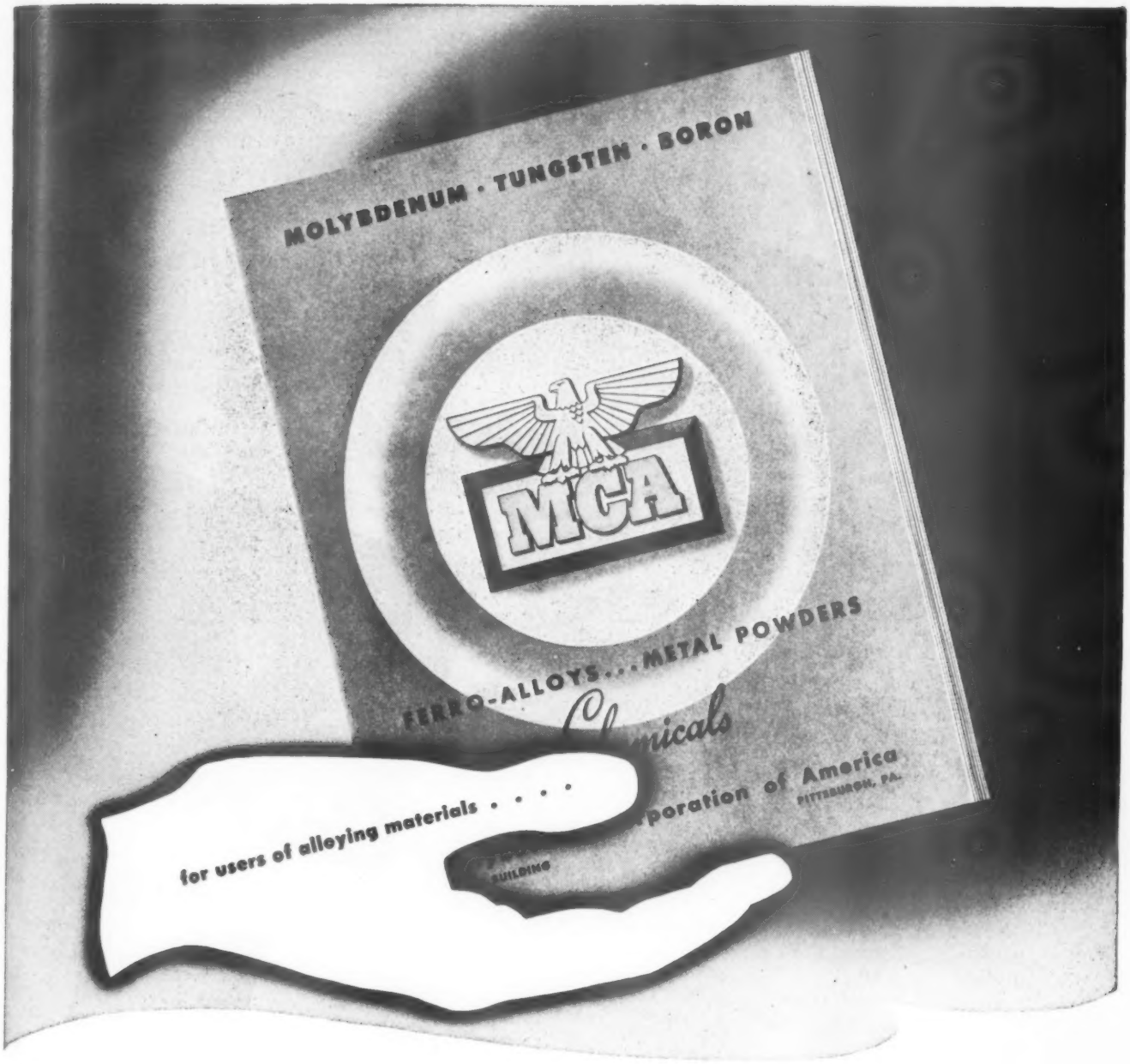
Control of Electric Motors, by Paisley B. Harwood, cloth, 479 pages, 5½ x 8½ inches, published by John Wiley Sons Inc., New York. Price $5.

This second edition of a work first published in 1936 and dealing with control devices for electric motors, has been completely revised to conform to modern practice, and to include recently developed devices and methods. New chapters are provided on synchronous motor control and variable voltage control. Arrangement of the book has been changed considerably from the older edition in that in the present volume the controllers are described in the chapters covering the type of motor to which they apply.

The book is divided into 20 chapters relating to various phases of electric motors and their control such as direct and alternating current contactors and relays; accelerating methods; wiring diagrams; construction of control apparatus; magnetic brakes; and various types of direct and alternating current motors.

Gives Safety Rules

American Standards Association, 29 West Thirty-Ninth Street, New York 18, has published a 32-page booklet entitled, "Safety in Electric and Gas Welding and Cutting Operations" designed to serve as a guide for the protection of the individual operator from injury or illness, and for the protection of property from fire or other damage arising out of improper methods in installation, operation or maintenance of welding and cutting equipment. Copies may be obtained from the association for 40 cents each.



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MCA

FOR CLOSE *Metallurgical* CONTROL

Induction melting furnaces. Each generator operates two furnace coils using No. 70 crucibles

In this foundry the bronze is melted in high frequency induction furnaces having a capacity of 210 lbs., and when exceptionally large rings are made, in oil-fired crucible furnaces of 1200-lb. capacity

The picture shows several of the induction furnaces directly in front of the pouring floor. Each generator is arranged so two furnaces can be run from it at one time. The individual furnaces are of the lift-coil type, using crucibles.

A movable table holds two crucibles enabling the operator to melt one charge while the other crucible is being prepared for melting.

The induction melting of bronze in crucibles brings a reduction in melting losses, together with a desired mixing action. By careful weighing of the charges, a very close chemical control is obtained of the finished product.

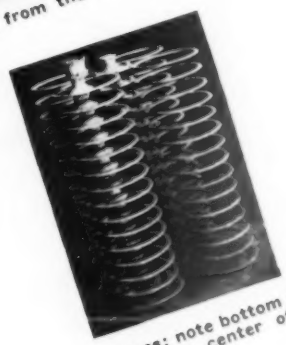
The molten metal in the crucible during the melting cycle is covered with borax and a silica sand to minimize oxidation and occlusion of gases. After skimming, the crucible of molten metal is poured into ring molds.

In the manufacture of bronze rings with tin, nickel and lead, it is essential that this close metallurgical control be exercised to meet specifications for hardness, tension, and other physical properties.

Always, when close control is a requirement, it is most readily and easily met by melting in crucibles.

Photographs courtesy Koppers Company American Hammered Piston Ring Division, Baltimore, Maryland

Pouring from the crucible into ring molds.



Ring trees; note bottom pouring sprue in center of ring stack.

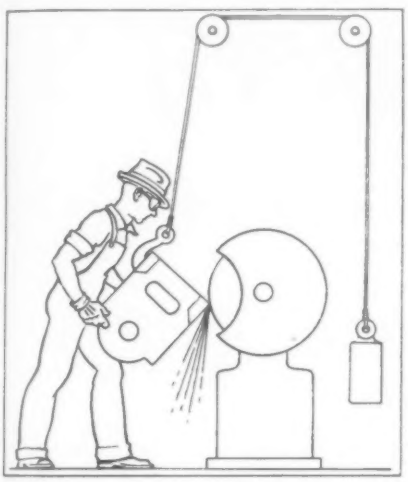
Typical Crucible Furnace Installations No. 3.

CRUCIBLE MANUFACTURERS ASSOCIATION

90 WEST STREET, NEW YORK 6, N. Y.

foundry DEVELOPMENTS

LACKING a swing grinder to snag a batch of large awkward aluminum castings, an eastern foundryman erected a swinging rig to take the weight of the casting while he manipulated it in front of a stationary type grinding wheel. Device and method of operation are shown in the accompanying illustration. A 20-foot, ¼-inch, wire cable with a hook at one end is attached to a counterweight at the other, and



reeved through 2 small sheaves on an overhead beam. The inventor modestly admits the device is merely an adaptation of the well-sweep and old oaken bucket with which he was familiar as a boy on the farm.

♦ ♦ ♦

CRITICAL shortage of coal in Great Britain as well as gas and electricity which has resulted in close control of the fuel situation and in a fuel economy campaign to hold consumption to the minimum, keeps British foundrymen on their toes to save fuel wherever possible. A recent article in *Foundry Trade Journal*, describes how one foundry used up slack coal in the form of briquets for such operations as cupola lighting, ladle and spout drying, lighting up core ovens and space heating stoves where lump coal previously had been employed. Procedure is to riddle the slack coal through a ¼-inch riddle, and mix the screened material in the dry state with cement and sawdust in the proportions of 48 pounds coal, 6 pounds cement, and 3 pints sawdust. Then 7½ pints of water is sprinkled over the mass, and mixed again. The moist material is rammed in a tapered wooden form to give briquets 6 x 4 inches at the large and 3¼ x 5¼ inches at the small face, and 2½ inches thick. Briquets are allowed to air 5 to 6 days before use.

♦ ♦ ♦

TO PRODUCE iron castings which are resistant to high temperatures such as grate bars, ingot molds and annealing boxes, or which possess a chilled surface such as railroad car wheels, valve tappets, etc. U. S. Patent No. 2,339,673 proposes to stabilize the iron carbide by use of nitrogen. Addition of the nitrogen may be accomplished in various ways including the addition of nitrided iron powder, bubbling ammonia gas through the molten iron, addition of ammonia bearing compounds as ammonium carbonate, ammonium chloride, etc.

♦ ♦ ♦

AIMING to throw cold water on the belief that manganese bronze must be fumed well at high temperature to secure sound castings, W. G. Mochrie in *Foundry Trade Journal* recently described an investigation which indicates that the practice is not necessary. Pouring wedge test bars at temperatures ranging from 1090 to 890 degrees Cent. (1994 to 1634 degrees Fahr.) he observed the evolution of zinc fume rating it high down to 970 degrees Cent. (1778 degrees Fahr.); low at 940 to 920 degrees Cent. (1724 to 1688 degrees Fahr.), and practically nil at 890 degrees Cent. Determination of physical properties of the bars showed hardly any difference between those poured at high and low temperatures; tensile strengths being 32 tons (71,680 pounds) per square inch with 40.6 per cent elongation at high, and 31.90 tons (71,456 pounds) per square inch with 40.6 per cent elongation. Similarly examination of the microstructure indicated no appreciable difference in the ratio of alpha to beta structure.

♦ ♦ ♦

FUNCTIONING of airplane motors is improved greatly by adequate cooling, and in the case of the rotary type motor the barrel is finned in addition to the head to increase radiation surface. However, the process of finning the barrel is accomplished by machining which takes time, and also limits the depth of fins which can be secured economically. Consequently, in U. S. Patent No. 2,326,418, a procedure is described for attaching aluminum alloy muffs containing deep fins to a thin steel barrel. Method is to clean and pickle the steel barrel, and apply a thin coat of cadmium on the exterior surface by the hot dip process. The aluminum muff is placed in a suitable mold, and heated to 1000 to 1060 degrees Fahr., and at the same time the cadmium coated steel barrel is heated to 450 to 600 degrees Fahr. When the desired temperatures have been reached the barrel is inserted in the aluminum muff, and the narrow space between the two is filled with molten aluminum at 1300 to 1450 degrees Fahr.

♦ ♦ ♦

STUDY in England of the relationship between brinell hardness number and yield stress in medium manganese cast steel containing 0.25 per cent carbon, 1.5 per cent manganese and normalized by a soak for 4 hours at 1700 degrees Fahr. (920 degrees Cent) followed by air cooling resulted in the following formulas:

$$Y.P. = BHN \times 0.08 + 12.56$$
$$U.S. = BHN \times 0.15 + 13.32$$

The values of course, are in tons per square inch, and that for yield point is accurate within ± 1 ton per square inch while that for ultimate strength is accurate to± 1.5 tons per square inch. All of which reminds us that Jim MacKenzie, American Cast Iron Pipe Co., Birmingham, Ala., studying a wide variety of gray irons believes that the formula:

$$T.S. = 273 \times BHN - 23{,}700$$

is a good criterion for those materials.

♦ ♦ ♦

TO OBTAIN high initial cooling without substantially modifying the stress reducing characteristics of mineral oil used for quenching of metals, U. S. Patents Nos. 2,327,976 and 2,327,977 describe the use of up to 10 per cent thermalyzed tung oil in neutral paraffinic mineral oil, and of up to 20 per cent terpene polymerized resin.

♦ ♦ ♦

RESISTANCE of methyl methacrylate resin to attack by acids is the basis for a new use of that plastic as lining for tanks holding chromic and sulphuric acid anodizing solutions for treatment of aluminum alloy aircraft parts. Sold under the tradename "Lucite" by E. I. duPont deNemours & Co. Inc., sheets of the plastic line 28,000-gallon tanks at Curtiss-Wright Corp., Columbus, O. It is claimed that the material has extended life of the tanks materially. The plastic is not affected by sudden temperature changes, and was found to be less expensive, lighter, less subject to breakage, and easier and safer than the material which it replaced. E. B.

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WHEELABRATOR will give you "7 League Boots" for metal cleaning production, enabling you to take long, swift strides forward; outdistancing competition to give your customers better finished, cleaner castings . . . quicker! Let's let a few satisfied users report on the basic considerations:

TIME: *"5 hours former cleaning time reduced to 15 minutes."*

PRODUCTION: *"Provided 60% more cleaning capacity over former sand-blasting equipment."*

COSTS: *"53.2% reduction in costs per ton."*

LABOR: *"Reduced direct labor cost 50%."*

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These reports from our files are not exceptions but rather average statements. Such evidence from over 2000 users proves that the Airless Wheelabrator will give you a change of pace over outmoded cleaning methods.

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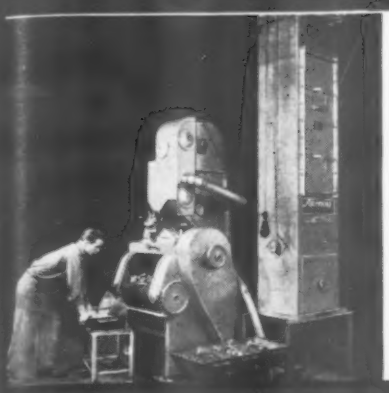

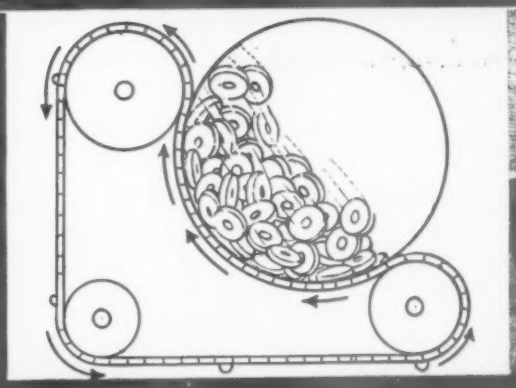

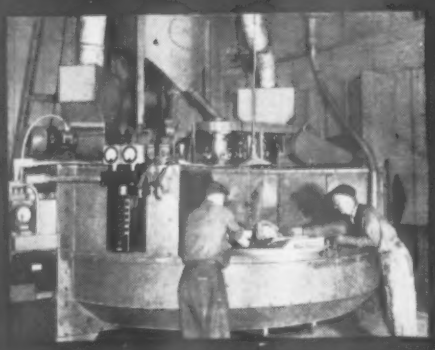

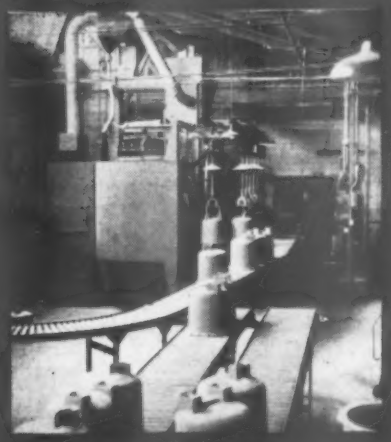

AMERICAN
WHEELABRATOR

BY PAT DWYER

Drawings By RICHEY

ONE night recently while sitting in front of my humble cot, engaged in the peaceful and highly enjoyable occupation of doing absolutely nothing, if one may except the slight effort involved in sucking a mild volume of smoke through the stem of a corncob pipe, Bill came around the corner with his hat in one hand and his coat draped carelessly over his left or other arm. He threw both—the hat and coat, not the arms—on what the optimistic members of the family call the lawn, but which I regarded as a pain in the neck until the present summer when one of my able young grandsons, in consideration of bribes and other valuable considerations, took over the job of nipping the grass every Saturday afternoon. He does a fairly good job, but recently, probably as a result of having read *Tom Sawyer*, I notice he skilfully delegates a considerable amount of the work to an understudy. Up to the present I have not discovered in what proportion they split the loot. It is no trouble to see how they split the work.

After the fashion of city dwellers I have no idea of who or what kind of people live in the various houses on the street. Now and again I see cars driving in or backing out of the garages, but the identity of drivers or passengers is totally unimportant. Occasionally a pedestrian passes by on the sidewalk and may or may not cross my line of vision. Even in the first instance no impression is created. Five minutes afterward if any person asked me to describe one of these paraders —of course no person ever has asked me —but, as I say, if 5 minutes afterward any person should ask for a description, I probably should tell him brazenly and positively that I had been sitting there for an hour, and certainly no person had passed during that time. Furthermore, did he want to make something out of it?

Bill is endowed, or cursed—take your choice—with a greater degree of curiosity. He directed my attention to a lady who had just come into view dragging a lump of a ragged dog on the end of a long leash. The lady strolled along nonchalantly, sniffing the breeze, now and again holding up the unoccupied hand to admire the long and gaudy nails, and indulging in the other little tricks and mannerisms by which strolling ladies indicate to one and all that God's in His heaven and all is well with the world. Apparently the dog held entirely opposite views. I imagine if he had been gifted with speech, we would have been treated to a snappy bit of sparkling, vitriolic and forensic English. Each time he stopped to investigate any object, that to his doggy mind needed personal investigation, he was dragged away. In retaliation after the manner of a sulky child, he tried to dig in his nails and hold back each time he was dragged back on the concrete sidewalk.

"Who is the dame with the terrier?" Bill inquired.

"Probably a stranger around these parts," I answered truthfully and cheerfully. "I never saw her before."

"Well you did not miss much. I know if I never see her again it will be too soon. Whenever I see one of them there dizzy fashion plates dragging a poor innocent dog around by the neck against all his inclinations—"

"Yes, yes," I interrupted hastily, "I know what you are thinking, but the windows are open and several pairs of little sharp ears are not far away. Your highly commendable attitude in regard to our humble four-footed friends of the animal kingdom reminds me of a letter I had several months ago, some time in May, from one of my sons who is helping our mutual friend Uncle Sam to tell certain people who's who and what's what. Stick around a few seconds while I whistle to one of my assistants to bring me the letter. Business of whistling and sticking around. Thank you, my dear. Here it is. Listen:

DEAR GAFFER, and so forth and so forth. A heat wave rolled into town from somewhere last week. Weather movements are as unpredictable as those of the army. We are here today and gone tomorrow. Since I put on this soldier suit I have been shuttled around to so many camps I have lost count of 'em. Just when you begin to get acquainted with a bunch of guys the outfit is broken up and scattered like wisps of thistledown and blown away. Gone with the wind. We were not shifted this time, but we were jumped over-night without any warning from winter into summer. Reliable thermometers here and there indicated a temperature of 87 degrees on the scale invented by the late Herr Fahrenheit. Volume of sweat dribbling from the good and presumably other not-so-good citizens of the city swelled the river unseasonably almost to the flood stage or high-water mark. We went over to one of the city parks, but soon discovered that most of the inhabitants of the city and adjacent parts of the state were moved by the same idea. Part of the day we spent prowling through the Museum of Natural History, then came out to lie exhausted on the grass and go through a slow process of dehydration.

The subcontractor does all the work

Lightened and refreshed, batteries recharged and all that kind of stuff and faintly nauseated over the picnic antics of a mob of gabby and spectacled kids, we ambled over to see the birds and beasts in a run-down zoo at one end of the park. Two large polar bears could not seem to make up their minds whether to stay up on the rocks and be barbecued, or dive into the garbage-filled moat to cool off. Every few minutes they plopped into the pool and came up with cigaret butts and gum wrappers clinging to their whiskers and stuck in their ears. Then they slowly crawled back on the rocks and repeated, as the band boys say, ad lib. The whole performance was so pitiful I almost cried.

A polar bear is about as smooth and tough and strong as a 10-foot torpedo and as seaworthy as a fishing schooner out of Gloucester flying home in the fall of the year before a whistling northeast gale, lee rail under and a succession of great green waves cascading aft in a smother of foam and spray. Fishermen, whalers, explorers and other seafarers in the lonely, desolate and bitterly cold northern seas occasionally sight one of these magnificent animals paddling along nonchalantly 200 miles from the nearest land or ice pack, yet here were these two fine specimens plopping in and out of a cesspool, while a motley crowd of women and men, soldiers, sailors, Mexicans, Negroes, squalling babies and 57 varieties of ordinary citizens watched with morbid amusement. One demoralized young scut persisted in throwing small stones at the bears, presumably hoping thereby to provoke the animals into more action. I was tempted almost to the ultimate limit to grab him by the ears and throw him to the bears, but I feared his mean little carcass might give these noble animals acute indigestion. Seems to me the prophet Elias or Eliga or something —call him Eli and let it go at that—got away with a stunt of that kind in the

(*Concluded on page* 116)

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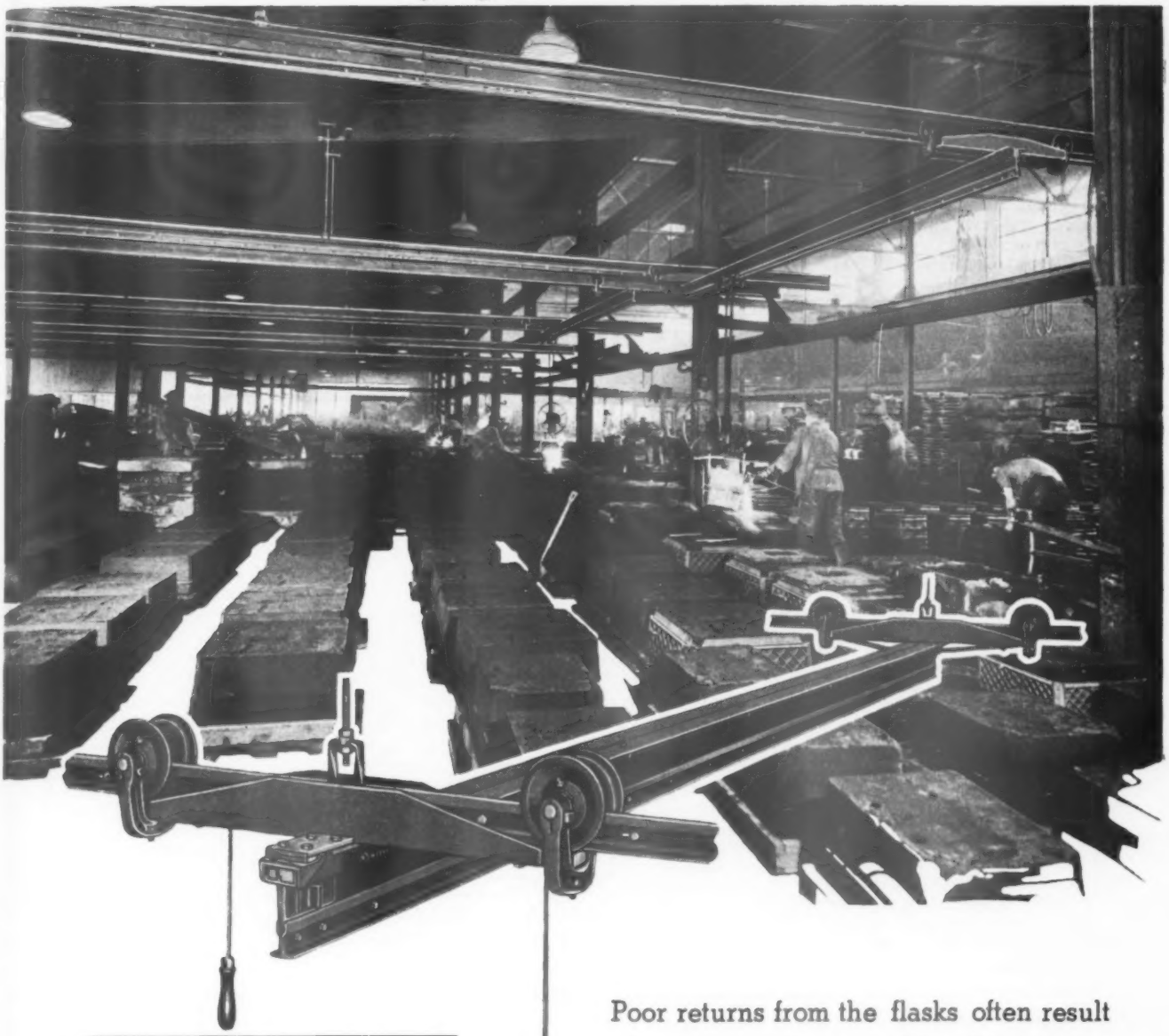
Aid Pouring for BETTER CASTINGS



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THE AMERICAN MONORAIL CO.
13104 ATHENS AVENUE CLEVELAND 7, OHIO

(*Concluded from page 114*)

brave days of old. An orchid to the old boy's memory!

Another fence enclosure contained a pair of mangy coyotes, captured somewhere out on the great wide open range. In the well-considered opinion of men who have had any dealing with these shifty-eyed slinkers—you can use the other word if you like—coyotes are by far the most intelligent, craftiest, smartest and cagiest creatures in the animal kingdom. I imagine these two must have spent most of their time kicking themselves for allowing any slow and clumsy human beings to capture them and put them in a cage.

"Well, deal me out and call me a dummy," the male probably was muttering savagely and sourly to himself. "It is tough enough to have to live in a cage, but where and how, in the sacred name of Lobo, king of the wolves, did I slip up and let myself be caught?" His lady partner probably was indulging in a few thoughts along the same line. If she ever escaped she would tell him a thing or two, the big dummy!

The buffalo pasture was a sad travesty on the former great open prairie extending from the Mississippi to the Rockies, and from the Canadian Northwest to the Rio Grande. Thousands and thousands of square miles where the herds roamed at their own sweet will, thick as the leaves on Vallambrosa before the white marauders came with their Sharps rifles and mowed 'em down, as the great combines in later years laid down the standing grain.

A small herd of molting cows and bulls with a sad looking covey—or whatever you call a bunch of calves—stood there listlessly and paid no attention whatsoever to the two-legged usurpers who eyed them with an almost equal degree of listlessness. The element of interest or curiosity, so far as I could see, was balanced fairly and evenly between the lookers-out and the lookers-in.

One patriarchal old bull whose patchwork hide appeared to be draped on him here and there with the careless abandon of an old soak stumbling out of a hay stack in the morning, stood on a knoll in lonely and pitiful dignity, just as though he was still under the necessity of guarding the herd. If he had any thoughts at all in the shaggy big head of his—which incidentally and lacking a hair cut would just about fit with a good push and a shove into an ordinary coal bin—these problematical and random thoughts must have been concerned with restless and vagrant winds, the march of the seasons as the great constellations wheeled in the sky, Indian and white hunters; gory battles with snapping and tearing rings of hungry wolves, and the long, long, wild migration trails that bent far and wide over the free and unfenced face of half a continent.

"What the hell"—or whatever kind of a word is favored by a buffalo bull under stress of really deep and poignant emotion—"What's the use of being a buffalo any more?" he might have been mumbling in his beard. "'Tis true—or at least so I have heard—I never have seen it and probably never will see it—some people away back East named a town after us, and I have heard my grandfather talk about a cowboy campfire song about Buffalo Gals coming out to dance in the light of the moon. Sounds kind of silly if you ask me! A wretched miniature caricature of grandpa appears on one of the lesser and base metal United States coins. Mark my words, if this rationing is continued much longer our few surviving members probably will wind up as meat points. A fine how-d'ye-do finish for the one time Monarch of the Plains! In imagination I can see the newspaper headline, the product of some 4-F smarty-puss: *Vanishing Herd Vanishes Down War Worker's Gullets.* Bah!"

"A very noble effort indeed," Bill admitted handsomely after I had folded the paper and whistled for an attendant to take it back and place it in a folder containing copies of correspondence with and from the various members of the clan scattered for the past few years and through force of circumstances over the far parts of the world. "I agree whole heartedly with that young man in his attitude toward our silly habit of capturing wild animals and keeping them cooped up in pens and cages where they scarcely have room enough to stretch out at full length, or enjoy a good healthy sneeze, or a cough or a yawn.

"A moment's calm reflection should convince any person that we lack even elemental consistency in our thinking, and to a great extent in many of our actions. Take this here now sticking in a cage stuff for instance. As a punishment for nearly any kind of a crime, the perpetrator, if he is caught and tried, is sentenced to spend part or all the remainder of his life cooped up in a pen. The basic idea is to deprive him of his liberty, and of course incidentally to prevent him from repeating his former avocation of infringing on the liberty of other people by sticking them up, burning their houses, or any other specialty.

"On the other hand, innocent animals that attend strictly to their own affairs and keep as far away as possible from mankind and therefore guilty of no crime, are stalked and hunted and dragged back to be stuck in a cage for the remainder of their lives. What is honest, or charitable, or humane, or—to quote one of the usual goofy reasons—educational about a program of that kind? If we paid more attention to a proper method of dealing with the ever-increasing number of wild human animals, the world would not be in the mess it is in today."

Societies To Meet At Congress

Two additional technical societies will participate in the forthcoming National Metal Congress and War Conference Displays to be held at Public Hall, Cleveland, during the week of Oct. 16. They are the Society for Experimental Stress Analysis and the American Industrial Radium and X-ray Society. Headquarters of the first will be at Hotel Carter, and sessions will be held both morning and afternoon on Oct. 17 through 20 with the annual dinner on Thursday evening Oct. 19.

Headquarters of the American Industrial Radium and X-ray Society will be at Hotel Hollenden, and technical sessions will be held mornings and afternoons on Oct. 19 and 20 with a special meeting of the Cleveland section on Oct. 16.

To attract a gallery this bathing beauty should have a broad band around the chest inscribed MISS BERING SEA, 1944

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to Oversize Pistons and Valves

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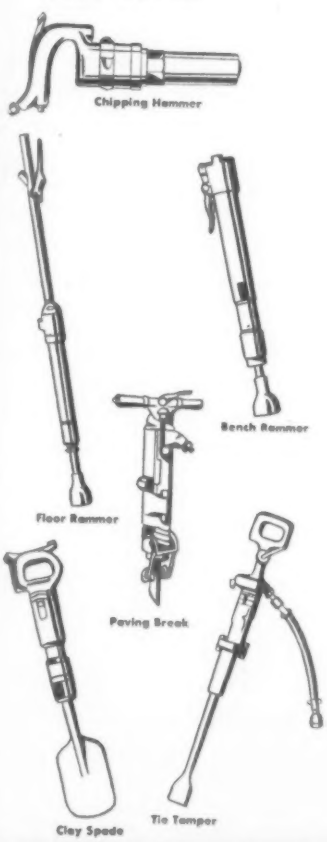
when you rebuild with "MASTER" Hard Chrome back to standard—

ANY MAKE
ANY STYLE



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BASIC LINED CUPOLA

Reduces Sulphur, Phosphorus

RECENT improvements in basic refractories, and particularly in development of a basic patching material, have caused renewed interest in possibilities of achieving reduction of sulphur and phosphorus in the basic-lined cupola. In the past the great disadvantage of burnt dolomite as a cupola lining material has been hydration and disintegration on contact with atmospheric moisture. That feature also precluded use of a wet patching material for repairs. A new stabilized dolomite clinker now has been produced[1], and is available both as ramming material for monolithic linings and as brick. A stabilized dolomite cement also has been developed which can be mixed with water and applied as a patching material similar to ganister in the acid cupola.

First detail of the use of those materials in a production cupola was published by Renshaw[2], and dealt mainly with opportunities of desulphurization with the basic lining. Melting Furnaces Subcommittee of the Technical Committee of the Institute of British Foundrymen in investigating the subject has had made available to it further information which opens up other interesting possibilities, particularly with dephosphorization. While the subcommittee still is engaged actively in examining results obtained in practice with basic-lined cupolas, it feels that the information at present available is of sufficient interest and importance to warrant the publication of this first report which described work carried out to date.

Experience has been obtained with monolithic linings prepared from dolomite clinker and using the special patching material for repairs. Main points arising in connection with the use of these materials are as follows:—

Basic lining should have a thickness of 9 inches and should extend from the bottom of the shell to a height of at least 4 feet 6 inches above the tuyeres.

Stabilized dolomite lining material is mixed with 6 per cent water and 1 per cent liquid sodium silicate in a small pan mill, the sodium silicate being previously dissolved in water. Optimum charge is 4-5 hundredweight, (448 to 560 pounds) and this takes about 5 minutes to mix. In this way a suitable quantity of mix becomes available for ramming. It has been found convenient to add 8-9 per cent water in the first instance, and to reduce to 7 per cent by additions of dry material. Actual ramming is then carried out at a moisture content of approximately 6 per cent.

An allowance of ⅛ inch per foot is made for expansion of stabilized dolomite (the actual expansion is 1.5 per cent) and an appropriate space is left between ramming and shell or backing firebricks. Asbestos, slag wool and asbestos sheeting can be used for this purpose. Sheeting is used to hold the wool in position as ramming proceeds. No expansion allowance is made immediately above the tuyeres, and this space is rammed solid for a height of 12 inches, then the expansion allowance is continued. If expansion allowance were continued from the tuyere level, the air blast might circulate behind the lining and disintegrate it. Lining is taken to the top of the combustion zone, and no neutral course is necessary between top of the lining and firebricks of the shaft. Bottom is put in with sand, according to normal practice.

Cupolas in which the first monolithic basic linings were used have holes drilled into the shell to facilitate drying. As stabilized dolomite is air setting, a period of air drying is essential, so that the maximum strength may be developed. Experiments have shown that the air drying period should be of the order of 24 hours. With a lining 9 inches thick, heating by coke or gas is then required for a further 24 hours, following which the cupola is ready for service. One lining has actually been in use after a total of 12 hours drying. Although no detrimental effects were observed, this practice is not considered advisable.

Stabilized dolomite material used for repairs to the lining is mixed in a pan mill with 18 per cent water. It should be used as quickly as possible, since it also possesses hydraulic setting properties which are accentuated by the fineness of the material.

Life obtainable from a stabilized dolomite monolithic lining is important, because the cost of materials and installation is several times as great as that of a firebrick lining. Information so far available on lining life applies only to cupolas worked in such a way that desulphurization is obtained, that is with a minimum of oxidation. Under these conditions a cupola melting metal of ultimate composition T.C 2.80, Si 1.50 per cent gave a lining life in combustion and melting zones of 12 to 16 weeks, equivalent to a total metal throughput of 2000 tons. Lining in the well withstood 26 weeks' operation, during which approximately 4000 tons of metal were melted.

Under these conditions the consumption of patching material is similar to that of ganister in an acid cupola engaged on similar service, and is of the order of 60 pounds per ton of metal melted. Consumption appears sensitive to the melting rate of the cupola, and it is inadvisable to operate at an output greater than 80 per cent of the maximum obtainable

(*Continued on page* 121)

From a report presented at the annual meeting of the Institute of British Foundrymen held in Manchester, England.

TABLE I DEPHOSPHORIZATION WITH MINIMUM SILICON IN CHARGE.

PHOSPHORUS INCREASED PROGRESSIVELY IN EACH MELT BY THE USE OF WROUGHT IRON

Melt No.	Metal Charge (Pounds) Steel Scrap	Metal Charge (Pounds) Wrought Iron	Charge Comp. Per Cent Si	Charge Comp. Per Cent P	Average Final Analysis (Per Cent) Si	P	Mn	S	T.C.	Phosphorus Reduction
Ex. D.P. 7	1300	....	0.30	0.060	0.20	0.022	0.15	0.120	2.50	63.3
Ex. D.P. 8	1300	....	0.30	0.060	0 34	0.029	0.21	0.130	2.70	52.0
Ex. D.P. 9*	900	400	0.20	0.133	0.062	0.028	0.16	0.110	2.60	79.0
Ex. D.P. 5†	975	325	0.23	0.200	0.20	0.053	0.17	0.110	3.06	73.5
Ex. D.P. 6‡	720	580	0.20	0.300	0.16	0.065	0.13	0.100	2.85	78.0
Ex. D.P. 12§	....	1300	0.050	0.60	Tr.	0.12	Tr.	0.130	2.70	80.0

* Wrought iron, 0.30 per cent P. Steel scrap, 0.060 per cent P. † Wrought iron, 0.60 per cent P. Steel scrap, 0.060 per cent P. ‡ Wrought iron, 0.60 per cent P. Steel scrap, 0.060 per cent P. § Wrought iron, 0.60 per cent P.

TABLE II DEPHOSPHORIZATION WITH SILICON PRESENT

	Metal Charge (Pounds) Steel Scrap	Wrought Iron	Ferro-Silicon (78% Si)	Charge Comp. (Per Cent) Si	P	Average Final Analysis Si	P	Mn	S	T.C.	Phosphorus Reduction
Ex. D.P. 13	1300	...	10	0.90	0.060	0.33	0.035	0.27	0.110	2.70	41.0
Ex. D.P. 14	1300	...	16	1.26	0.060	0.70	0.036	0.25	0.090	2.54	40.0
Ex. D.P. 15	1300	...	30	1.80	0.060	0.97	0.039	0.29	0.090	2.70	35.0
Ex. D.P. 17*	1100	200	20	1.37	0.110	1.06	0.061	0.28	0.069	2.70	45.0
Ex. D.P. 16†	1100	200	35	2.15	0.110	1 50	0.059	0.27	0.082	2.86	46.4

* Wrought iron, 0.40 per cent P. Steel scrap, 0.60 per cent P. † Wrought iron, 0.40 per cent P. Steel scrap, 0.60 per cent P.

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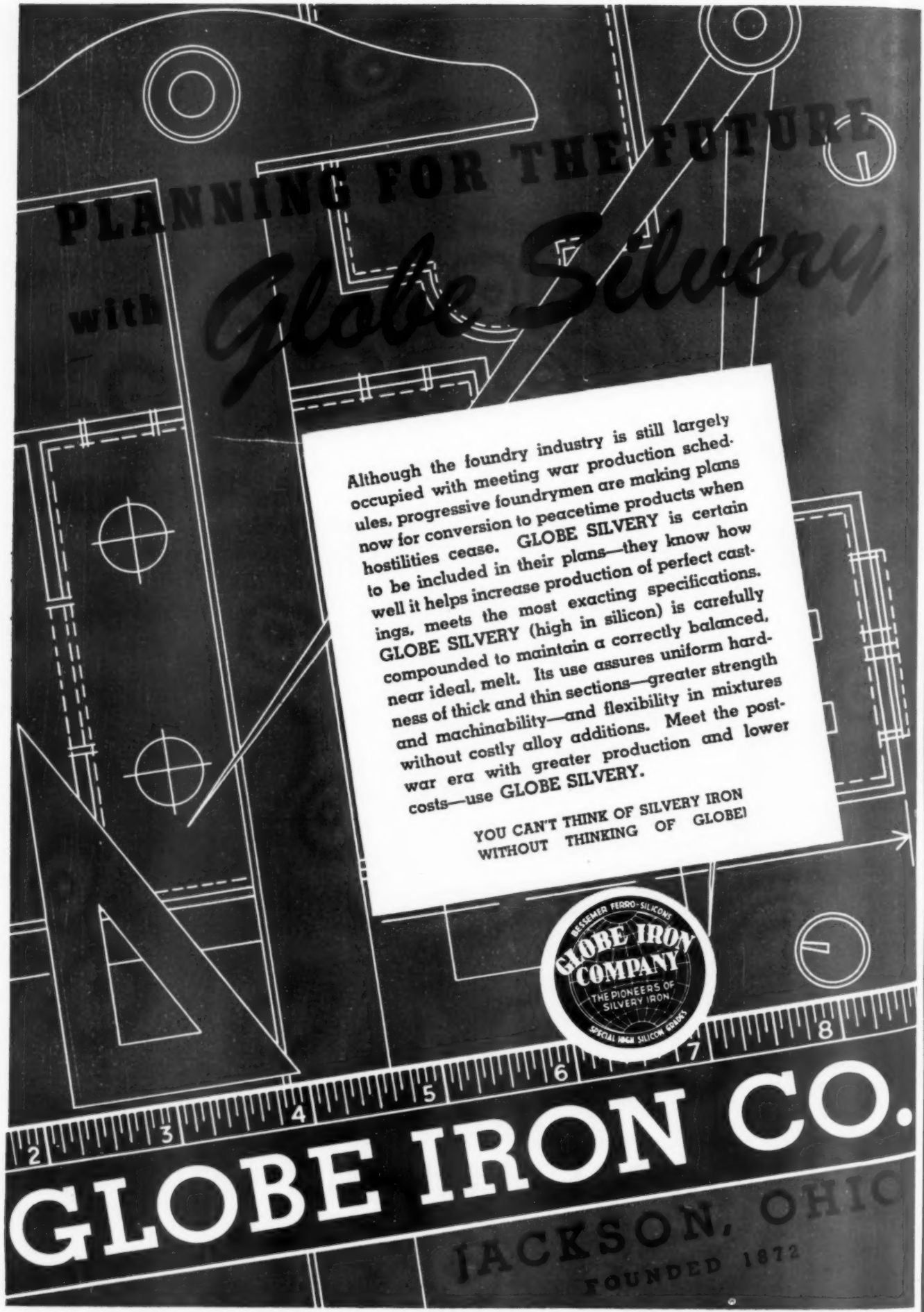
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(*Continued from page* 118)

from a given cupola diameter and coke ratio.

Observations on stabilized dolomite linings have shown that in the combustion zone there is a cracking and "tendency to flake" of the working face. This may be due to shrinkage spalling or to inadequate expansion allowance, although it is felt that the latter is extremely unlikely. Due to the high refractoriness of the material, only a slight thickness of the lining sinters (¼ to ½ inch), and it is thought that cracking phenomenon is due to differences in properties between sintered working face and back portion of the lining. Lining ultimately fails apparently due to lack of strength in the back portion of the monolith.

In the well, there is cracking of the working face, but to a less extent than in the combustion zone. It is thought that slag penetration and seasoning of the lining is responsible for this difference. Resistance of lining to attack by basic cupola slag is very good.

From results available, it is believed that it will be possible to improve life of these materials. An attempt is therefore being made to develop a more durable lining and a more efficient patching material.

In one instance a basic cupola has been lined with chrome magnesite bricks from the top of the well upwards to a height of 4 feet 6 inches above the tuyeres. Lining in the well was of stabilized dolomite monolith. Two courses of bricks were used making a lining thickness of 9 inches. This lining gave excellent results in service and patching consumption using stabilized dolomite patching was of the same order as that with a stabilized dolomite monolithic lining. Details of total life are not available, but after daily use for four months the backing layer of bricks was still in good condition.

A complete lining of stabilized dolomite bricks has been used, including the well and extending to a height 4 feet 6 inches above the tuyeres. An expansion allowance was made between the shell and the first course of bricks, asbestos steam pipe lagging being used to a thickness of ½-inch. This lining showed an appreciable improvement over rammed stabilized dolomite. Initial erosion was small, being indicated by a 30 per cent reduction of patching material required for the first week's run. By the end of the third week of operation, however, the normal amount of patching material was necessary for repairs and averaged about 63 pounds per ton of metal melted.

There is no evidence to show that the spalling tendency of basic bricks has any detrimental effect on the performance of the lining, although cracks immediately develop after the furnace is dropped each day.

Using a basic stabilized dolomite lining, Renshaw[3] has shown how sulphur can be removed during cupola melting by use of a basic slag. Cupola, which is fitted with a continuous tapping spout, allows maintenance of a considerable volume of slag in the well. The drops of molten metal must, of course, pass through this slag before leaving the cupola.

To test the effectiveness of desulphurization a variety of different mixtures was melted ranging from 100 per cent gray iron to charges composed entirely of steel scrap and ferrosilicon. In all cases average sulphur content of the molten metal was less than 50 per cent of that when melting similar mixtures in an acid furnace. In the melt when all steel charges were used average sulphur content of the molten metal was 0.049 per cent. Limestone charges used in this melt were 7 per cent by weight of the metal charges and 1 per cent fluorspar was charged with the limestone. Charge coke consumption was 14.3 per cent.

Using charges of 100 per cent cast-iron scrap having a sulphur content of 0.120 per cent the average sulphur content of the molten metal produced from the basic cupola was 0.056 per cent, that is a sulphur reduction of 53 per cent. In each melt first metal tapped from the cupola had a higher sulphur content than succeeding taps, due to the fact that at this stage only a small volume of slag was available in the well and temperatures were below normal. A reduction in the volume of slag present in the well later in the melt was found to lead to an increase in sulphur content of the metal.

Slag produced under conditions of maximum desulphurization had, when cold, a light brown chalky appearance. By overblowing the cupola, thus creating an oxidizing condition, it was found that sulphur in the metal rose from 0.050 per cent to 0.075 per cent, with a change in the color of the slag to dark brown.

This process has been put into commercial production, and metal is being produced regularly with a sulphur content 50 per cent lower than was obtained from an acid furnace. When required, final figures between 0.03 and 0.05 per cent sulphur can be obtained.

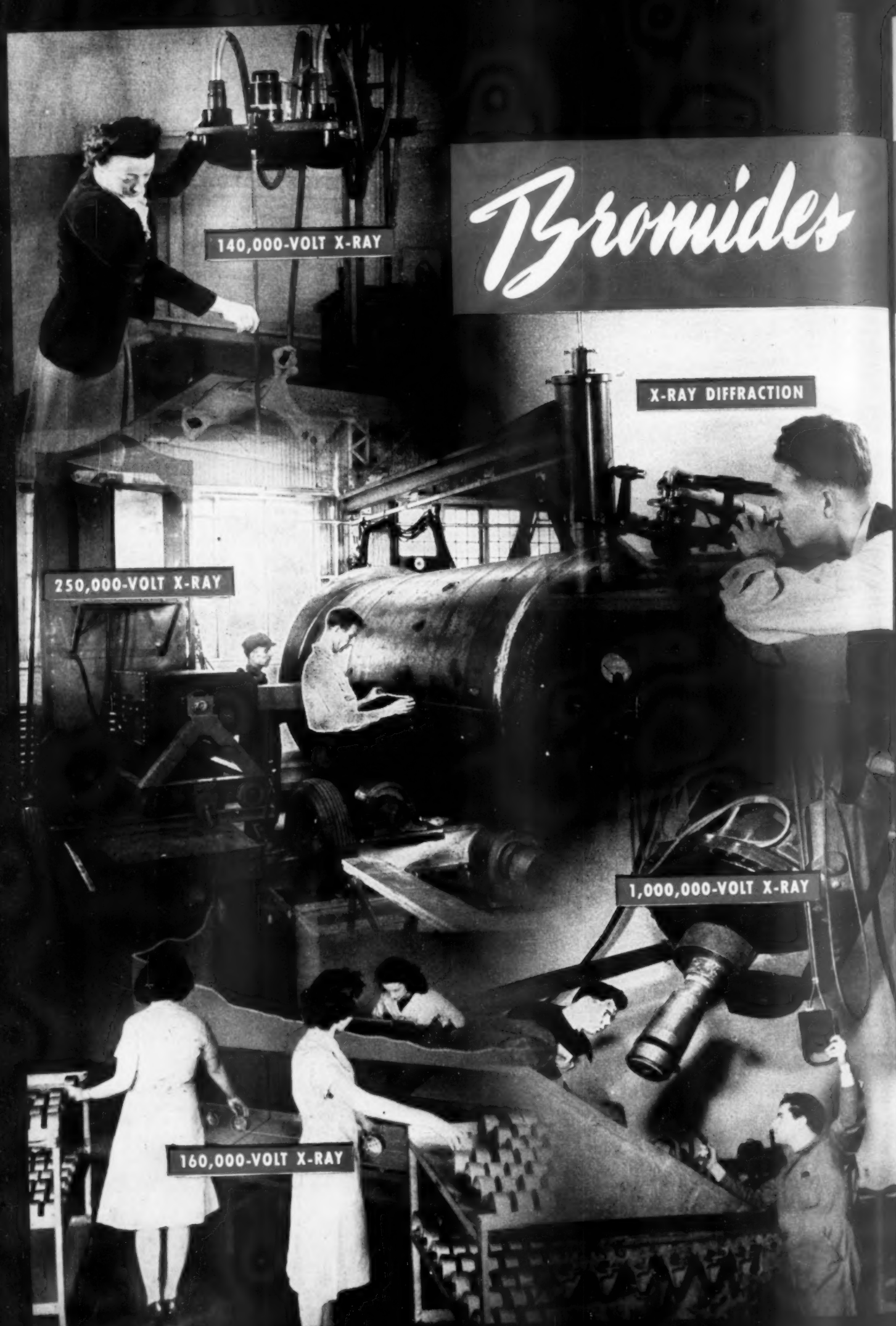
In metallurgical processes concerned with removal of phosphorus, certain fundamental reactions occur, comprising the oxidation of the phosphorus constituent to iron phosphate, followed by its ultimate removal in the slag as calcium phosphate. Phosphorus is retained in the slag only when the latter is strongly basic, and to a certain extent oxidizing. Retarding effect of silicon is very pro-

(*Continued on page* 124)

TABLE III.—DEPHOSPHORIZATION WITH PIG-IRON AND STEEL SCRAP CHARGES

	Charge				Charge Composition		Average Final Analysis					Total Phos. Reduction %	Phos. Reduction in Pig-iron* %	Remarks
	Steel Scrap Lb.	Wrought Iron Lb.	Pig-iron Lb.	Mill Scale Lb.	Si	P	Si	P	Mn	S	T.C.			
Ex. D. P. 10	1,150		150		0.40	0.140	0.30	0.077	0.26	0.070	2.98	45	35	Pig-iron: 3.80, 2.30, 0.76, 0.90, 0.046 Object.—To use high phos. pig-iron to replace hematite iron in Tropenas Charge.
Ex. D. P. 11	1,040		260		0.40	0.30	0.15	0.21	0.31	0.103	3.10	30	22	Pig-iron: 3.80, 1.20, 1.25, 0.80, 0.060 Object.—To find the limiting effect of silicon when present in the phosphorus-rich portion of the charge.
Ex. D. P. 18	900		400		0.37	0.257	0.35	0.19	0.45	0.083	2.82	26	20	Pig-iron: 4.0, 0.76, 0.70, 0.97, 0.107 Object.—As Ex. D. P. 11.
Ex. D. P. 20	900		400	30	0.37	0.257	0.26	0.185	0.48	0.130	2.84	28	21	Pig-iron: As Ex. D. P. 18. Object.—To attempt oxidation of phosphorus with Mill Scale.
Ex. D. P. 19	840	200	260		0.95	0.107	0.67	0.064	0.41	0.097	2.80	40		Pig-iron: 3.80, 3.75, 0.053, 0.87, 0.097 Object.—To find the limiting effect of Silicon when the phosphorus is present in the low-silicon portion of the charge.

*Calculated on the assumption that the phosphorus in the steel scrap was reduced to 0.025 per cent. (See melts Ex. D. P. 7 and Ex. D. P. 8.)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(*Continued from page* 121)

nounced, and its removal is considered necessary before phosphorus can be eliminated effectively. Preliminary work carried out in the basic cupola in an attempt to reproduce those reactions in this type of furnace, is reported herewith.

Using an all pig iron charge, the cupola used having an internal diameter of 24 inches and being fitted with a continuous tapping arrangement, the amount of dephosphorization varied between 5 per cent and 50 per cent, but was in no way consistent, being almost dependent on the extent of the silicon removal. In general, samples which showed the maximum silicon loss also gave the maximum amount of dephosphorization. For example, when silicon was reduced from 0.77 per cent to 0.05 per cent, 50 per cent dephosphorization was obtained.

Tables I, II and III give results obtained in a series of melts using steel scrap as the base material of the charge; the phosphorus was increased in the charge by the addition of wrought iron and, also the limiting effect of silicon on dephosphorization was investigated.

Basic cupola used for these melts was of standard design lined to 36 inches; this furnace being in regular production as part of a duplex cupola-electric furnace unit. Experimental melts followed the normal daily production with the exception of melts Ex. D.P. 9 and Ex. D.P. 12, which were conducted as entirely separate melts. Cupola is fitted with a continuous tapping arrangement previously described[3], and as the well of this furnace carries only a small weight of metal, with no intermediate ladle between cupola and electric furnace, frequent sampling at 5-minute intervals is necessary, the average of the samples giving a more representative analysis. Analytical results therefore are condensed in Tables I, II and III, and details of one of the individual melts are given in Table IV.

Table I indicates extent of dephosphorization with a minimum percentage of silicon in the charge. Table II gives results with varying amounts of silicon added to the charge in the form of ferrosilicon. In the series with no avoidable silicon present, some difficulty was experienced in operation, there being a tendency to bridging. The relatively small amount of silicon added in the second series appeared to off-set this effect, and there were no apparent melting difficulties. Experimental results with steel scrap and pig-iron charges are given in Table III, and indicate that a certain amount of dephosphorization of pig-iron is possible when melted with a high percentage of steel scrap.

As with other processes concerned with dephosphorization, if any useful degree of phosphorus removal is to be obtained, silicon must be removed by intense oxidation. In the present series of experiments using pig-iron only in the charge, the iron ore added with the intention of creating an oxidizing slag proved to be almost ineffective. Low FeO content of the slag indicated that the iron ore was reduced by incandescent coke at a higher level than the melting zone.

With low silicon materials, as in the experiments using steel scrap, Table I, up to 80 per cent dephosphorization was obtained without the addition to the charge of an oxidant. This suggests that in absence of silicon, molten droplets of metal are easily oxidized and this inherent oxidation is sufficient to allow iron oxide formed to react with the phosphorus. As shown in Table II, the inclusion of ferrosilicon in the charge reduced dephosphorization to around 40 per cent, but the reduction was not in proportion to the quantity of ferrosilicon added. In this series silicon is not present in that portion of the metal charge to be dephosphorized as distinct from the pig-iron experiments, where both silicon and phosphorus are present in the same constituent of the charge. The series reported in Table III indicates the limiting effect of pig-iron additions on dephosphorization, the object of each melt being described in the table.

TABLE IV—
DETAILS OF MELT EX. D. P. 13

Metal Analysis

Sample	C	Si	Mn	P	S
C27	2.76	0.53	...	0.038	0.110
C28	2.85	0.24	0.30	0.038	0.116
C29*	2.45	0.29	...	0.034	0.120
C30	2.73	0.29	0.25	0.030	0.110
C31	2.72	0.29	...	0.037	0.100
Avg.	...	0.33	...	0.035	....

***Slag Analysis**

SiO_2	Al_2O_3	CaO	MgO	FeO	MnO	S	P
33.20	9.12	43.33	11.08	1.00	1.75	0.53	0.056

Details of Cupola Charge

	lb.	Ave. Analysis Si	Mn	P	S
Steel scrap	1300	0.20	0.46	0.06	0.07
Ferrosilicon	10	78.00			
Coke	216				
Fluorspar	20				
Limestone	100				
Air per min.	250				

Reviewing the results as a whole, it may be deduced that when silicon is present in that constituent of the charge to be dephosphorized, phosphorus reduction is relatively low, depending to a certain extent on the percentage of the high phosphorus constituent in the charge. Alternatively, when silicon is not present in the portion of the charge to be dephosphorized, and is concentrated in a small percentage of the charge (as ferrosilicon) as in Table II, the possibility of phosphorus removal is greater. Experimental work so far carried out has shown that if conditions are suitable for the removal of phosphorus, desulphurization is restricted. Oxidizing conditions favorable to dephosphorization are unfavorable to desulphurization.

It should be noted that the total quantity of phosphorus lost by the metal has not been accounted for in the slag (Table IV), the constitution of which is in no way comparable with that of dephosphorizing slags associated with other processes. It may be assumed that such a cupola slag would be incapable of retaining any quantity of phosphorus as calcium phosphate due to its low oxidizing properties and relatively low basicity, compared with dephosphorizing slags produced in electric and open-hearth furnaces. As cupola lining material used in these experiments was stabilized dolomite which contains up to 20 per cent silica, the slag basicity was undoubtedly lower than it would have been with a more basic refractory, such as magnesite. Analysis of the fritted portion of the lining taken from the melting zone showed a certain amount of phosphorus absorption to the extent of 0.30 per cent. However, this does not account for the total quantity of phosphorus removed; the remainder may possibly be discharged with the stack gases, but a preliminary attempt to absorb it in water was unsuccessful.

Present work reveals the necessity for a considerable amount of further experiment before any positive theory of the nature of the reactions can be formed. Relatively small amount of dephosphorization which was obtained in the above reported experiments on pig-iron appears to justify a continuation of the work which would probably involve some modification in the design of the cupola.

Opportunity offered by the basic cupola for desulphurization has obvious applications in manufacture of steel by the converter process, and also in processes where low sulphur cupola melted metal is required to be tapped direct into a batch-type furnace for duplexing, as in the manufacture of short cycle anneal malleable, etc. It also may be of value in enabling charges containing large proportions of scrap to be used in production of light castings and in other applications where cupola melted metal of consistently low sulphur content is required.

Work so far carried out on dephosphorization implies a fulfillment of certain immediate requirements of the cupola-converter process, and possible advantages to this process may be stated as follows: To make possible use of higher phosphorus steel scrap; to substitute higher phosphorus pig iron for hematite iron in the cupola charge; to produce a steel with lower phosphorus content than is obtained normally from the acid converter, thus closely approaching the analysis of basic electric steel, and to offset the phosphorus increase in steel produced due to metallic losses in cupola and converter.

Successful application to practice will depend on obtaining economical refractory life and in development of a correct operating procedure best determined by practice based on a more complete understanding of reactions involved. Basic cupola may also prove of value for melting of ferroalloys, such as ferromanganese, where slag produced is of a nature which rapidly attacks an acid lining.

An aspect of the subject not considered in this report, but which is engaging attention of the sub-committee, is the influence of basic cupola melting on the properties of gray cast iron. Work of Heiken suggests that an abnormal pick-

(*Concluded on page* 126)

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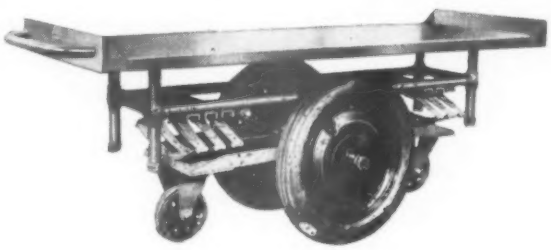

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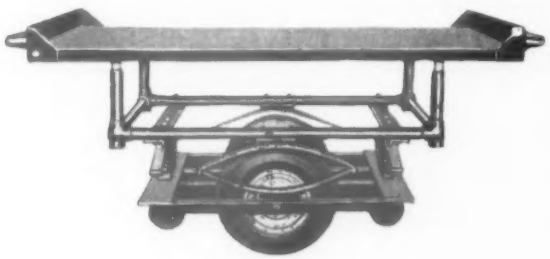

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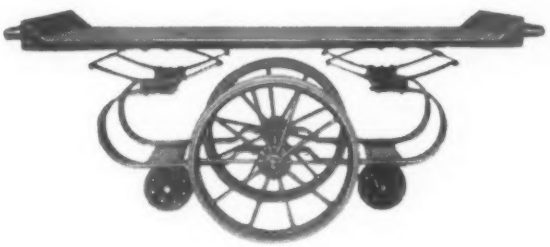

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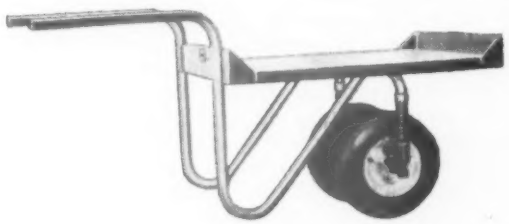

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(*Concluded from page* 126)

up of carbon may be expected, but no confirmation of this has been obtained so far when operating a basic cupola under conditions favorable for desulphurization. It will be noted also that carbon contents reported in the section on dephosphorization are of the same order as those obtained when melting similar mixtures in an acid furnace.

Constitution of the Melting Furnace Subcommittee of the Technical Committee included L. W. Bolton (convener), F. A. Rivett (secretary), P. A. Davenport, V. C. Faulkner, J. F. Gist, J. Jackson, E. Morgan, E. S. Renshaw and E. Shaw. Corresponding members—C. H. Kain, F. K. Neath and H. H. Shepherd. J. W. Gardom (convener), Technical Committee. J. Bolton (acting secretary).

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[1] Dolomite Bricks for Use in Steel Works. T. Swinden and J. H. Chesters. *Journal,* Iron and Steel Institute, 1941, No. 2, Vol. 144.

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Magnesium Founders Discuss Costs

Over 40 members and guests attended a meeting of the Sand Cast Division of the Magnesium Association held at the Cleveland Hotel, Cleveland, Aug. 9. Dan W. Moll, Hills-McCanna Co., Chicago, presided and was assisted by Perry D. Helser, secretary-director.

Discussion topic of the meeting was cost methods, and was opened by Mr. Moll who pointed out that two important considerations will have to be undertaken by the magnesium casting industry after the war. One is to educate consumers on the advantages and applications of magnesium castings, and the other is to develop methods for producing castings at a lower cost to enhance their competitive position.

Mr. Moll then proceeded to describe the costing system employed by his firm. He said that the castings were divided into three classes metallurgically, following the British and Canadian systems. The first class was that in which the failure of a single part might result in loss of life and such castings were subject to 5 per cent minimum x-ray examination; the second class was that in which failure of two or more castings might result in loss of life, and the third class was nonstructural castings.

In general, costs are determined under five departments including melting, molding, coremaking, cleaning and inspection. Burden or overhead is determined and distributed to the various departments as a rate per hour. According to Mr. Moll, best procedure is to charge all direct and indirect labor against the specific job so that the true cost can be ascertained. Scrap developed is divided into two classes and charged against the job according to origin. First or rough scrap is that found at the shakeout, and the second or final scrap is that occurring after cleaning and inspection.

Mr. Moll said that a bonus system was used in such departments as melting, molding, coremaking and cleaning. In the melting department the bonus is paid in the pounds of metal handled or melted per hour. In molding, the bonus is paid on molder productivity, and the same procedure is employed in coremaking. In the cleaning department, a collective bonus is paid for direct labor, and a certain percentage of that for indirect labor. Cost of heat treating is determined on a pound basis, since that is easy to ascertain. In conclusion, Mr. Moll called attention to the advisability of maintaining a close check on core losses, such as broken, mashed and otherwise defective cores. He stated that these may run much higher than one might suspect, resulting in high costs.

Joseph B. Meier, OPA, Washington, discussed importance of proper costing in pricing castings. He said there was a wide range of casting prices in the different branches of the foundry industry, but not as great in magnesium foundries. He stated that several fundamental considerations are required in establishing cost systems, including: No method is better than the cost facts behind it. There is no need for an elaborate system for a small plant, so each should be tailored to the size of the foundry. The cost system cannot be a substitute for sound common sense or judgment.

He pointed out that to establish good costing procedure, it is necessary to know the volume of business. Where possible, a good year, a bad year and an average year should be selected to ascertain the normal volume. He indicated that departmentalized costing is the best procedure, that indirect labor can be tied to direct labor by a percentage factor, and such general manufacturing costs which can not be allocated directly can be added as a percentage.

To illustrate a possible error in finding proper metal cost in the casting Mr. Meier used the blackboard to indicate the proper method. Taking 100 pounds of metal as charged into the crucible at 23 cents a pound, or $23 for total metal cost; the weight of good castings was 30 pounds; weight of bad castings, gates and risers, and pigged metal was 43 pounds; weight of spills, grindings, etc. was 23 pounds, and oxidation losses 4 pounds. Weight of the bad castings, gates and risers, and pigged metal could be reused in the foundry as primary metal and its value was set at 23 cents a pound while the spills and grinds being unusable are sold for 10 cents a pound. Total value of metal in those items comes to $12.19, which subtracted from the original $23 leaves $10.81 for the value of the metal in the 30 pounds of good castings, or 36 cents a pound instead of 23 cents. Similarly if the cost of melting is 3 cents a pound, total cost of melting 100 pounds of metal is $3. However, the good castings weigh only 30 pounds, so the cost of melting per pound is 10 cents instead of 3 cents. Hence, actual cost of metal and melting per pound of casting is 46 cents instead of 26 cents.

I.B.F. Investigates Youth Problems

A 22-page brochure recently issued by the Institute of British Foundrymen contains special report No. 4, "Report and Recommendations of the Education Committee upon the Education and the Workshop Training of Young Foundrymen." For the past few years members of the institute have been deeply concerned by the acute shortage of apprentices and learners engaged in the foundry industry and by the high rate of wastage among the younger employes. They realize, of course, that the problem of recruitment is not peculiar to the foundry industry. Many other industries are facing the same difficulties.

The present report of the Institute's Education Committee is divided into two parts: "Education of Young Foundrymen," and "Works Training." The first part considers general, pre-employment education, post employment education, national certificates, the British Foundry School, universities and recommendations on pre-employment education, post employment education and universities. The second part under the heading "Works Training" discusses types of apprentices, craft apprenticeship-general, craft apprenticeship schemes, general and references.

In a general summing up the following points are stressed as important links between practical training and other aspects of the apprenticeship problem:

(a) The best apprenticeship scheme will fall short of complete success unless working conditions in all sections of the industry continuously are brought up to date.

(b) While some improvement in the standard of general education of youths entering the industry can be expected, owing to the intended raising of the school leaving age, nevertheless, the existence of systematic training schemes and the improvement of working conditions are essential if there is to be any substantial improvement in the recruitment position of the foundry industry.

(c) Technical training is a necessary corollary to practical training for two reasons. The workman of the future will have to be better informed regarding the underlying principles of the trade. To provide a foundation for further technical training for the outstanding or ambitious apprentice or journeyman who is aiming at technical and supervisory work. Compulsory attendance at part time young peoples colleges will provide some opportunity for technical training, but adequate facilities should be offered for all promising apprentices.

Shipments Decline

Shipments of electric melting furnaces in May totaled $952,000, compared with $965,000 in April and $1,370,000 a year ago, according to WPB.

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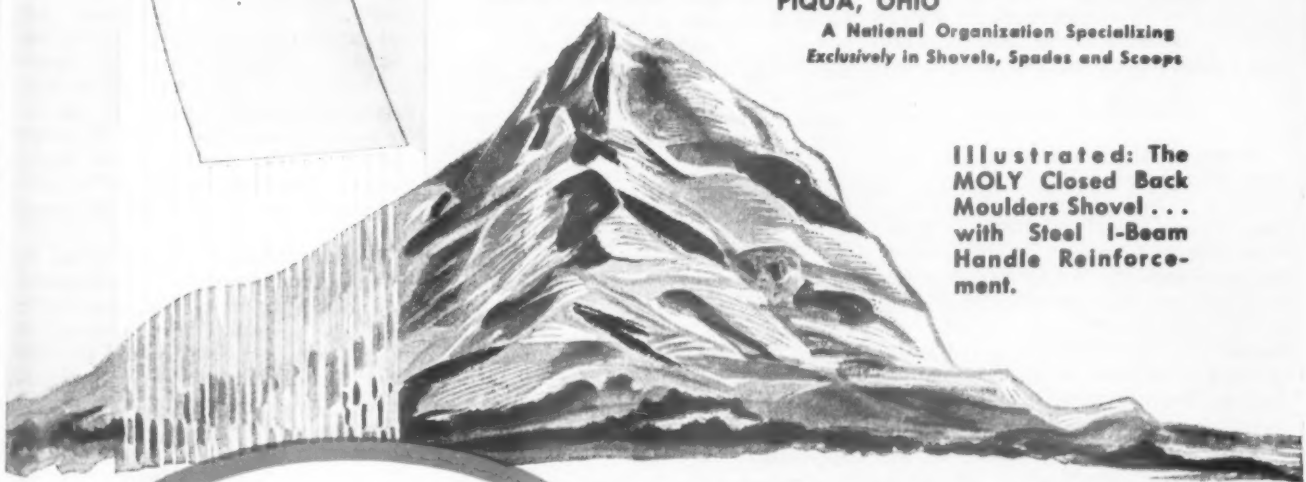

Illustrated: The MOLY Closed Back Moulders Shovel . . . with Steel I-Beam Handle Reinforcement.

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APPLYING FLUOROSCOPY

To Industrial Inspection

By R. W. MAYER
Kelley-Koett Mfg. Co.
Covington, Ky.

MANY industrial x-ray users who started using the equipment originally because of government requirements, have learned the value of inspection beneath the surface for the information it has given them, enabling them to improve quality, reduce costs and save labor. These users are not likely to discard their x-ray equipment, for it has proven its value. Quite probably they will pass along what they have learned and establish acceptance standards of their own on purchases of castings, welded parts and various assembled units and require x-ray inspection on the part of their suppliers.

Industrial x-ray and fluoroscopy are still in early stages of progress and are due for a large postwar expansion. One of the elements that will contribute to that expansion is the improvement of presently available types of x-ray machines and the creation of new machines and accessory devices. Progress thus far, has been much greater along the lines of straight radiography than on fluoroscopy, because x-ray has been, for years, fundamentally a tool for the medical profession.

Medical x-ray equipment for radiography required only minor modification for industry, but the medical fluoroscope is another matter. The principal reason for the slow development of the fluoroscope in medicine is the limit of x-ray that a patient can stand with safety.

Sensitivity Is Increased

However, you can't hurt a casting with x-ray, and the realization of this was the first step in the development of a fluoroscope with a sensitivity usable for common industrial applications. Of course, for some time the fluoroscope has been used to spot the presence of foreign bodies in packaged food, tobacco, soap, cereals, etc. The only problems on such inspection are those of a mechanical nature for the convenient handling of the sample.

Fluoroscopic inspection has a very strong popular appeal. It is very attractive to speculate on the possibilities of having the work pass across a screen and instantly separate the good from the bad —no waiting for films to be developed and dried, no films at all, no dark room, no delay. Savings mount, costs go down, and for these reasons there have been many attempts to widen the field of application of the fluoroscope, *but the stumbling block has always been lack of sensitivity for until very recently, a sensitivity of 15 per cent was considered normal, 10 per cent good, and under very unusual circumstances 8 per cent might be seen.*

Today, we know that these limits can be just about cut in half. In other words, a *sensitivity of 5 per cent or better can be counted on as a regular day in and day out production standard.*

It is well to recognize some of the inherent limitations of fluoroscopy. In the first place, radiographic technique charts on a penetration do not apply. Considerably higher voltages are required on a fluoroscope than on a film. The time factor permits the effect of the x-rays to accumulate on film. Only those striking the fluoroscopic screen at any instant are visible. The screen shows only the instantaneous image. There is no cumulative effect as with a film.

This limitation immediately translates itself into a limit of thickness that can be fluoroscoped because it is not practical to use a unit of more than 220 or 250-kilowatt capacity for fluoroscopy. The reason for this limit is principally a matter of safety. As the voltage is increased over these limits, there must be more than a proportionate increase in the thickness of lead and lead glass of the viewing cabinet. Moreover, with fluoroscopy, the x-ray is left turned on for a much longer period of time than is the case with radiography, which increases the importance of providing adequate protection to the operators. Our industrial laboratory has found the practical limits to be approximately 2 inches of aluminum and approximately ½-inch of steel.

A second limitation is sensitivity. Radiographic penetrameters are based on 2 per cent sensitivity, although on good radiographic work, flaws on the order of 1 per cent can be shown. While some excellent sensitivity claims have been made on the part of reliable observers, we prefer to state that the fluoroscope is practical for sensitivities of 5 per cent and a little better, at this time.

Thirdly, the fluoroscopic screen provides no permanent record. The results obtained are in what the observer sees and if a check is required, other means must be used.

Fourthly, *the degree of success with fluoroscopy depends on personal factors to a greater degree than is the case with radiography.*

These limitations have been listed to make it clear that fluoroscopy must not be considered a complete substitution for radiography. In the final analysis, it must also be kept in mind that the fluoroscope has definite advantages of time and cost, as mentioned previously, and also has certain exclusive advantages of its own.

For example, a radiograph provides a picture in one plane only, but in a fluoroscope the part can be rotated to provide a third dimension to definitely fix the location of the defects.

Also, certain types of defects, such as cracks and fissures will only appear on a film if the part is so placed that the plane of the crack lines up with the direction of a x-ray beam. The chances are very slim indeed of being able to place a part on film in exactly such a position, but in a fluoroscope the part can be twisted and turned until—suddenly—there it is.

Now, considering these several factors, it becomes evident that on most applications fluoroscopy will find its greatest value as a supplement to radiography rather than to be used alone. That is, the ultimate in an inspection setup that lends itself to fluoroscopy at all is a combination layout arranged to provide ready changeover from one to the other without sacrificing any of the advantages of either.

Let us consider what this involves. A fluoroscopic screen is observed through lead glass and the only practical arrangement involves the use of some sort of lead-lined cabinet with lead-glass viewing window. Since such a cabinet must have all the elements of protection required for radiography, and since the same x-ray generating equipment can be used for both fluoroscopy and radiography, it becomes unnecessary to construct a separate lead-lined radiographic room provided, first, that we can so design the cabinet as to make it adaptable for either radiography or fluoroscopy; and, second, that we arrange the control so as to make it, also, do double service.

Need Additional Controls

For the control unit two things are involved. The first is a foot switch control for the fluoroscopic observer, a very simple addition to any x-ray control unit; and the second is to provide stepless control of kilovoltage to permit the observer to "tune in" so to speak, to whatever value is required to penetrate the particular section under observation. At present there is no such control on the market, but an experimental model has been built and it will soon be available for general use.

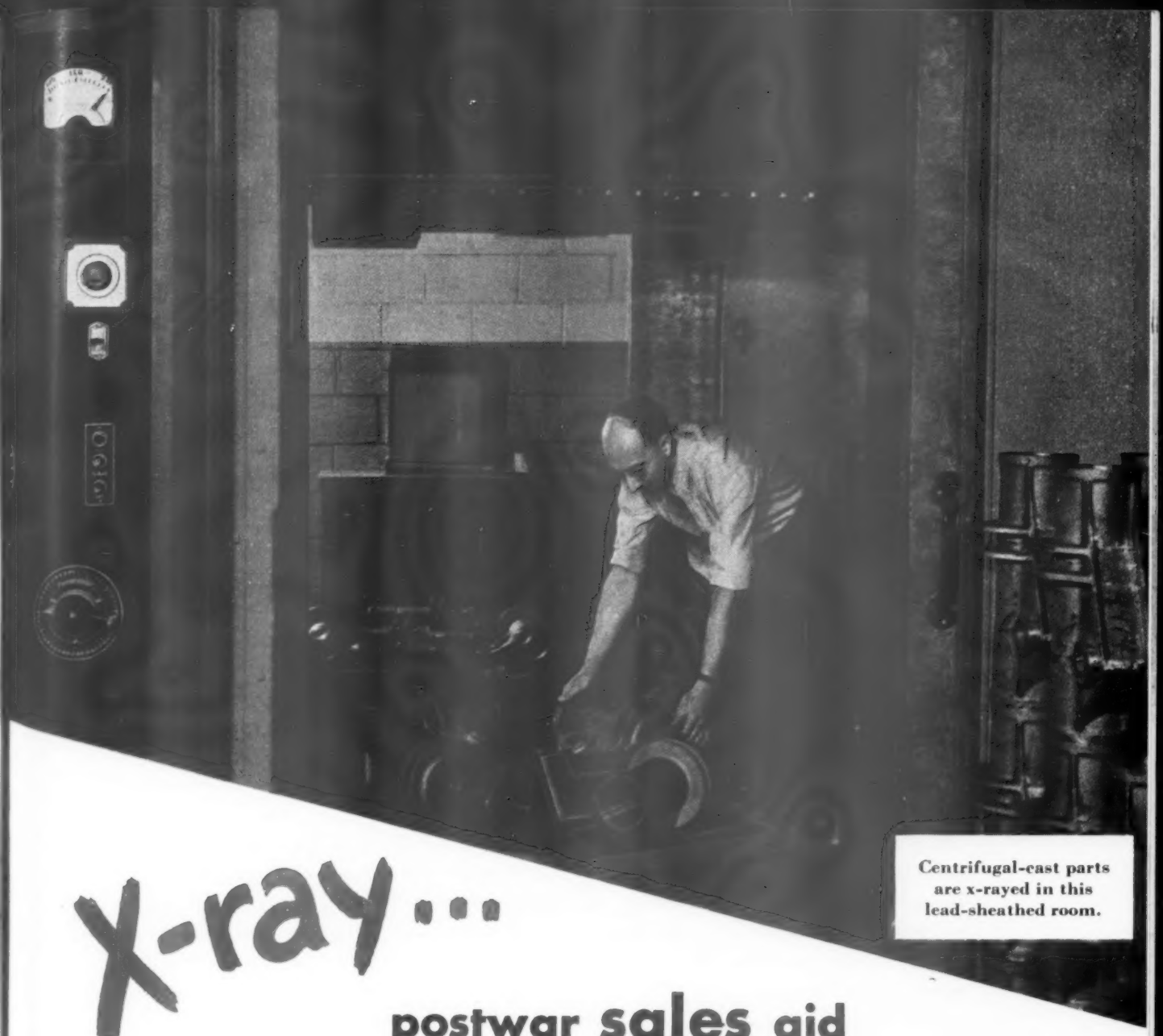
Regarding the cabinet, the actual development has been from the radiographic side. For some time, it has been recognized that a cabinet has certain advantages in cost, convenience and flexibility over the construction of a lead-lined room.

Personal Factors—Vision: *Choice of observer:* The prime requisite for a fluoroscopic observer is good vision. Ordinarily young people have the best vision and their eyes can be accommodated to various levels of brightness with less strain. It is considered that the best observers should be about 20 to 25 years old, either male or female.

There is much still to be learned concerning quality of vision, particularly with respect to the fluoroscope. For example, some people have better vision in one color than in another, and there are relative variations at different brightness

(*Concluded on page* 136)

From a report to the American Industrial Radium & X-Ray Society.



Centrifugal-cast parts are x-rayed in this lead-sheathed room.

X-ray . . .

postwar sales aid

You know what x-rays are doing for industry . . . helping contractors meet highly exacting specifications . . . and meet them exactly. But have you stopped to realize that x-rays can be made a potent sales aid as well as a factor for improved production?

Obviously, postwar markets are bound to be highly competitive. Every way that you can save on operating costs will give you just that much more edge on your competition.

And x-rays—proved effective as a factor for better production—are an excellent means of positively determining ways and means of cutting operative costs. For example, engineers of a leading automotive manufacturer determined that they could make big savings in material and man-hours by substituting a relatively lightweight centrifugal casting for a welded assembly of a number of heavy sections. But to sell the customer on the switch, they had to prove that the lightweight casting was every bit as strong as the heavy welded assembly.

X-rays did just that! Thorough x-raying of each cast part proved that it fully measured up to all specifications. Production time and materials required were reduced, costs correspondingly lowered.

That is only one instance of the way x-rays are working toward more efficient production—more profitable sales—in many fields of industry. Industrial radiography has a place in your own plant—on your own "sales force."

Kodak supplies a line of special films, solutions, and accessories for industrial radiography . . . and offers the experience accumulated in 17 years of research in this field. Eastman Kodak Co., X-ray Division, Rochester 4, N. Y.

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ANNOUNCEMENT

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This department concerns itself constantly with the improvement of carbon and graphite electrodes and graphite anodes. It also consults with and advises customers in the electrometallurgical and electrochemical industries on the application technique, and the efficient use of electrodes and anodes.

The key personnel of the reorganized department is headed by T. L. Nelson, and will consist of Dr. Charles H. Chappell, in charge of the electrothermic service division, and Dr. Neal J. Johnson, in charge of the electrolytic service division.

Mr. Nelson brings to the work both academic and practical training. For fifteen years he guided quality control operations for many of the carbon and graphite products of the company. He has spent much time in the field on actual application problems involving the use of electric-furnace electrodes.

Dr. Chappell's education and training also make him exceptionally qualified as supervisor of electrothermic work of the new department, while Dr. Johnson, outstanding research and process-engineering scientist, is thoroughly familiar with problems arising in the electrolytic division.

Many trained technical assistants are on the staff of the department, the entire facilities of which will immediately be placed at your service upon notice to any member of our nation-wide sales department.

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Brazilian Society For Metals Formed

By MIGUEL SIEGEL
Instituto de Pesquisas Tecnologicas
Sao Paulo, Brazil

Metallurgical industry in Brazil has developed by rapid strides. The outstanding project which has been discussed by American metallurgical trade papers is the steel plant at Volta Redonda which is being erected by the National Steel Co. of Brazil. This plant is to have an ingot producing capacity of 360,000 tons a year at the first stage of operation and of 1,000,000 tons when the project is completed.

To meet this industrial development research institutions have extended their facilities for metallurgical research and the Institute de Pesquisas Technologicas of the State of Sao Paulo has been operating a semi-industrial foundry which is now being expanded with the addition of forging and rolling equipment and with a heat treating department. There practices are developed which are made available to industry in general.

Education and training of metallurgists is being accelerated through the introduction of university and post graduate courses and practical instruction in plants and at the Instituto. Thus some of the universities, such as the one at Sao Paulo, have introduced mining and metallurgical engineering courses in addition to the existing ones for civil, electrical and chemical engineering.

For the first time a post-graduate course in metallurgy was begun by the University of Sao Paulo and sponsored by the Co-ordinator of Inter American Affairs. The lectures were delivered by outstanding American professors and metallurgists specializing in different branches of metallurgy. The course was inaugurated by Dr. A. Allan Bates, manager, chemical and metallurgical laboratories of Westinghouse Electric & Mfg. Co., followed by Prof. Robert F. Mehl, director, department of metallurgy and of the Metals Research Laboratory of the Carnegie Institute of Technology, Pittsburgh. The nonferrous metallurgy lectures were delivered by Prof. Arthur Phillips of Yale University and have recently been completed.

The response to these initiatives has been a most definite proof of the increased interest which now exists in Brazil for Technical knowledge in metallurgy.

Encouraged by these results, it was decided that the Associacao Brasileira de Metais—A.B.M.—Brazilian Society for Metals be organized in Brazil for the fostering of the progress of metallurgy.

The A.B.M. has functioned for the first six months under a temporary executive committee composed of: L. Dumont Villares, Acos Villares S/A; J. Souza Rezende, Maquinas Piratininga Ltda., and Miguel Siegel, Instituto de Pesquisas Technologicas, of Sao Paulo.

Its first conference, concerning discussion of open-hearth and electric furnace practice and steel castings, was held in Sao Paulo on April 27, 28 and 29 and Prof. Mehl was present as guest speaker. Representatives from Rio, Minas and Volta Redonda were present and at the banquet there was a large attendance.

Members recently have been elected as chairmen of the technical committees and local chapters, and they will constitute the board of directors of the A.B.M. Technical committees and chairmen include:

Administration and Economy of Iron & Steel Industry: Col. E. de Macedo Soares e Silva, Diretor Tecnico da Cia. Siderurgica Nacional, Volta Redonda, Rio de Janeiro.

Blast Furnaces: Dr. Louis Ensch, Diretor Geral da Cia. Siderurgica Belgo-Mineira, M. G.

Open-hearth Furnaces and Converters: Dr. Renato Wood, Sub-Diretor Tecnico da Cia. Brasileira deUsinas Metalurgicas, Neves, R. J.

Electric Furnaces: Dr. Alberto Pereira de Castro, Usina Santa Olympia S. A., Sao Paulo, S. P.

Ferro Alloys: Dr. Americo Rene Gianetti, Presidente da Eletroquimica S.A. Ouro Preto, M.G.

Steel Castings: Dr. Luiz Dumont Villares, Diretor da Elevadores Atlas S.A. Sao Paulo, S.P.

Iron Castings: Dr. Miguel Siegel, Chefe da Seccao de Fundicao do Instituto de Pesquisas Tecnologicas, Sao Paulo, S.P.

Rolling: Dr. Amaro Lanari Jr., Professor interino de Metallurgia Geral e Siderurgia, Escola Politecnica de Sao Paulo, Sao Paulo, S.P.

Refractories: Dr. Felippe Jose Vicente de Azevedo Franceschini, Ceramica Sao Caetano, Sao Paulo, S.P.

Nonferrous Metals and Alloys: Dr. Arthur Phillips, Professor Yale University, New Haven, Conn., and Professor contratado da Escola Politecnica de Sao Paulo, S.P.

Metallurgy of Nonferrous Metals: Dr. Tharcisio D. de Souza Santos, Professor interino de Metalurgia de Metais Nao-Ferrosos, Ecola Politecnica de Sao Paulo, S.P.

Physical Metallurgy and Heat Treating: Dr. Hubertus Colpaert, Chefe da Seccao de Metalografia, Instituto de Pesquisas Tecnologicas Sao Paulo, S. P.

Raw Materials: Dr. Ernesto Lopes da Fonseca Costa, Diretor do Instituto Nacional de Tecnologia, Rio de Janeiro, D.F.

Forging: Dr. Eduardo Garcia Rossi, Diretor da Fabrica de Ferragens "Lyrio", Sao Paulo, S.P.

Local chapters and their chairmen are: Sao Paulo—Jorge S. Rezende, director, Maquinas Piratininga Ltda.; Rio de Janeiro—Hildebrando Werneck, Glossop & Cia., and Volta Redonda—Fernando J. Larrabure, assistant metalurgico, Companhia Siderurgica Nacional.

Elections for president, vice president, secretary and treasurer are now being held in Brazil.

Name Is Changed to Marathon Corp.

Marathon Paper Mills Co., Rothchild, Wis., has changed its name to Marathon Corp. Its Marathon Chemical Co. division produces core binder and pattern plates.

American Machine & Metals Inc., has moved its New York headquarters to new offices in the Woolworth building, 233 Broadway, that city.

Leaders in the Brazilian iron and steel industry organized the Associacao Brasileira de Metais (Brazilian Society for Medals) in Sao Paulo in April

All Osborn Jolt-Squeezers come completely equipped with end-mounting match plate vibrator, automatic squeeze pressure release valve, blow gun, closing bench and riddle rack . . . all included in the original cost.

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PORTABLE and stationary Jolt-Squeezers in the Osborn line offer specialized features which have made them the largest sellers in this type of equipment.

The portable models are easy to move around because of 3 large-diameter wheels, regardless of floor conditions.

Machines are minimum overall width — very compact—so that they can be moved right up next to the sand pile. Working table height is low enough so that a man can roll his mould and draw it without strain.

Portable machines are equipped with a specialized straight-line-travel squeeze head which permits maximum ease and efficiency of operation on this type of machine—operators like them better, work easier and faster, produce more moulds at a lower unit cost.

Stationary Jolt-Squeezers feature both the straight-line-travel squeeze head and the post type swing head. Machines are very compact, can be set up close to the wall or on the shortest possible centers in mechanized systems.

All Osborn Jolt-Squeezers—stationary and portable—provide ample foot room so that operators can stand close and get the best lift . . . have conveniently located valves with vulcanized rubber pads for comfort. All have ample sized bearings, heavy section castings and ample jolt capacity over normal requirements.

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5401 Hamilton Avenue *Cleveland, Ohio*

OSBORN

MOULDING MACHINES

INDUSTRY ...Briefs

KINNEY ALUMINUM CO. is completing its new plant at Slauson and Boyle Avenues, Huntington Park, Calif., for the production of aluminum and magnesium alloy sand and permanent mold castings. The plant covers an area of 5 acres with 70,000 square feet of floor space, and will have a monthly capacity of more than 200,000 pounds of castings. Kinney Aluminum Co. is under the same ownership as Kinney Iron Works, Los Angeles, and its plant formerly was located at 2019 Bay Street, in the same city.

• • •

Fort Pitt Steel Casting Co., McKeesport, Pa., manufacturer of pressure and alloy steel castings, has been purchased by the H. K. Porter Co., Pittsburgh. The Fort Pitt company was founded in 1906 and now has an electric furnace capacity for 1500 tons of steel castings per month. T. M. Evans, president, H. K. Porter Co., has announced that the policies and management of the Fort Pitt company will continue unchanged under Fred Grotts, president. Acquisition of Fort Pitt brings to six the number of complete industrial plants operated by the H. K. Porter Co. in the manufacture of process equipment, locomotives, freight cars, pumps and ordnance materiel.

• • •

Increasing surpluses of aluminum and magnesium ingot are reflected in production cutbacks at government-owned plants. Aluminum production has been terminated at plants operated by the Aluminum Co. of America at Riverbank, Calif., and Burlington, N. J., and reduced one-third at the Torrance plant, Los Angeles—a total cutback of 12,000,000 pounds monthly. Magnesium production has been cut 7,517,000 pounds per month by terminating output of Dow Magnesium Corp. at Marysville, Mich., and reducing schedules of Dow at Velasco, Tex., of Magnesium Reduction Co., Luckey, O., of Electro Metallurgical Co., Spokane, Wash., and Basic Magnesium Inc., Las Vegas, Nev.

• • •

Gluntz Brass & Aluminum Foundry Co., 10803 Harvard avenue, Cleveland, is building a one-story foundry addition 30 x 175 feet adjoining its plant there and will move equipment from its branch at 3001 East Fifty-fifth street.

• • •

Foundry equipment orders declined slightly in June, but the month's sales were the third largest in 12 months. Sales index of the Foundry Equipment Manufacturers Association was 466.1, compared with 503.9 in May and 413.6 in June, 1943. The decline from May was entirely in orders for new equipment, sales of repair parts being practically unchanged.

• • •

Malleable iron casting production was practically unchanged at 70,449 tons in June. This compares with 70,123 tons in May, 69,111 a year ago and 59,990 two years ago, according to the Department of Commerce. Orders booked, less cancellations, totaled 103,194 tons in June, 91,614 in May, 78,289 a year ago and 55,032 two years ago.

• • •

Machine tool shipments in May were valued at $41,712,000, about the same as in April, while orders, less cancellations, increased to $59,852,000 from $55,247,000 in April, according to WPB. Since January, orders have more than doubled and shipments have dropped 26 per cent, leaving backlogs fairly steady at $186,343,000 on May 31.

• • •

Clover Mfg. Co., Norwalk, Conn., makers of coated abrasives and lapping and grinding compounds, and the Dirats Mfg. Co., Westfield, Mass., makers of precision grinding wheels, have made a working agreement whereby each organization will also handle the sales of the other's products.

• • •

Shipments of precision measuring and testing machines and instruments averaged $2,100,000 monthly during the first 5 months this year, compared with an average of $2,400,000 during 1943, according to WPB. Unfilled orders June 1 totaled $5,979,504, against $6,329,852 on Jan. 1.

• • •

Manhattan Rubber Mfg. Division of Raybestos-Manhattan Inc., Passaic, N. J., has received the National Advertising Agencies Network first award for its employe relations program. The company was awarded second prize for this program last year.

• • •

American-Terry Derrick Co., South Kearny, N. J., has changed its name to American Hoist & Derrick Co., Plant No. 2.

• • •

Mueller Co., 2801 East Twelfth Street, Los Angeles, is constructing a new foundry building, sand tower and bins, at a cost of $19,000.

• • •

Oscar W. Hedstrom Corp., 4836 West Division Street, Chicago, has purchased 125 feet of frontage at 2022 North California Avenue. Part of the property is improved with a garage, which has been enlarged and occupied by the corporation's army ordnance assembly plant formerly located at 1908 North Cicero Avenue. Company also operates another plant at 4941 West Chicago Avenue.

• • •

Whiting Corp., Harvey, Ill., has appointed the Cardinal Supply & Mfg. Co., 427 Sunderland Building, Omaha, Neb., as sales representative for cranes, foundry equipment, railroad equipment, aviation equipment and metalworking equipment in Nebraska and western Iowa.

• • •

Foxboro Co., Foxboro, Mass., manufacturer of industrial instruments for process measurement and control, has had its Army-Navy "E" Award renewed for the second time.

• • •

National Smelting Co., Cleveland, is rebuilding a group of its factory buildings at 13600 Kuhlman avenue, burned recently with $150,000 loss.

• • •

Republic Brass Co., Cleveland, plans construction of a one-story 19 x 36-foot foundry addition and 43 x 73-foot and 13 x 29-foot boiler room additions.

• • •

Globe Valve Co., Delphi, Ind., is rebuilding its plant, destroyed by fire, at cost of about $125,000, including equipment.

• • •

Walworth Foundries Inc., Walworth, Wis., has been incorporated by Carl T. Miller, A. G. Miller and E. L. Garbisch.

• • •

Dee Brass Foundry, Houston, Tex., has let contract for a one-story shop unit costing about $41,000.

• • •

Krengel's Inc., Twin Falls, Idaho, is building a foundry, first unit of a program of four buildings.

• • •

A. J. Bayer Co., Los Angeles, manufacturer of iron and bronze castings, will make additions covering 6500 square feet to its plant at 2300 East Slauson Avenue.

• • •

Wehr Steel Co., Milwaukee, has been awarded the Army-Navy "E" for excellence in war production.

• • •

Greenville, Mich., plant of the Federal-Mogul Corp.'s Marine Division was awarded the Army-Navy "E" at plant ceremonies July 12.

• • •

Cast Iron Fittings Co., 3501 East Twenty-Sixth street, Vernon, Calif., plans construction of a new foundry building to cost $2000.

• • •

THE FOUNDRY for August erroneously stated that T. P. Gardiner is starting erection of a one-story foundry building at 2707 Union Street, Oakland, Calif. Gardiner Mfg. Co. at that address states it has no plans for such construction.

Mexaloy Super Refractory Saves Linings and Equipment

Tough, non-fusible protective lining for ladles, spouts, runners and cupolas

Mexaloy is the ideal material for protecting refractory linings of cupolas, ladles, runners and spouts in both foundries and steel plants. Mexaloy makes the body containing it highly resistant to sudden, violent temperature changes and thus avoids spalling and cracking of the refractory. Practically infusible, it will not melt or change its character under the action of molten metal. Neutral and chemically inert, Mexaloy's presence insures resistance to fluxing and corrosive action by molten metals and slags. It provides a low-friction, surface which allows no foreign body adherence.

Mexaloy is extremely easy to apply. Mixed with clay, ground fire brick and water according to a simple formula, the resulting mixture is easily applied by tamping. Linings containing Mexaloy last longer. For example, in the spouts of open Hearth furnaces where the usual loom layer has to be replaced after every one or two heats Mexaloy linings invariably last more than 10 heats—sometimes as many as 30. In Foundry cupolas Mexaloy linings last longer and improve metal quality.

To greatly reduce "shut downs" in your steel plant or foundry due to refractory replacements, it will pay you to use Mexaloy. Write today for further information.

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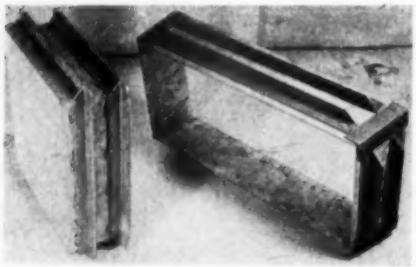
FOUNDRY MOLD JACKETS
Assembled by Welding

By ROGER VANDER VELDEN
Holland Furnace Co.
Holland, Mich.

PART of our work is to fabricate and maintain foundry equipment, and we think one operation we do will be of interest to foundrymen, namely, making mold jackets which support the sand after the mold has been stripped from the machine flask and while the molten metal is being poured.

It always has been somewhat of a problem to build jackets accurately so that they maintain their shape. The jacket under consideration is made of 12-gage galvanized sheet metal reinforced with ⅛ x 1½ x 1½-inch angle iron on the sides with corner braces of the same material, as shown at right of the accompanying illustration. The new jacket is at the left.

The size upon which manufacturing costs and material are based is as follows: Height, 9 inches; width, 25 inches; length, 30 inches. In making the old style jacket



New style arc welded mold jacket on left. Old style riveted jacket on right

it was necessary to cut the ends of each sheet at an angle of 10 degrees and maintain to close limits as the end pieces were used to locate the sides in proper relation. The latter were cut 9 inches wide and 25 inches long, which was just the right length for the width required; also when assembling, the 30-inch lengths could fit directly against the ends.

Operations in making the old style jacket were as follows: Cut sheets to 9-inch width, trim for required length to make 25 x 30-inch jacket. After cutting on square shears it was necessary to shape two sheets on each end to a radius to fit the inner corner of the angle iron that was riveted as braces or strengthening for the corner.

Next, the four corner angles and eight bracing angles were cut, then drilled every 2½ inches for rivets—this required a drill press and considerable time, as the edges of the holes either had to be ground or filed to remove the burrs before the angles could be riveted in place. Next the holes in sheets had to be countersunk to allow flush riveting as they had to be riveted inside to insure a smooth surface to the mold.

When this was accomplished the stiffening angles were riveted to the sides and ends, and the corner angles then were riveted first to the sides and then to the ends forming the complete jacket, which after squaring was ready for use. The main drawback of this procedure was the manufacturing time, also the persistence of the jackets to spring out of shape, requiring periodical inspection and reshaping.

In lots of eight jackets, time required on square shears, 32 pieces cut accurately, 2 hours; shaper time, 3 hours; cutting time for 96 angles, 4 hours; drilling time on angles, 608 holes, 3 hours; drilling and countersinking holes in plates, 4 hours; riveting time, 2 men each 8 hours (total 16 hours); squaring time, 2 hours 30 minutes. Total time, 8 jackets—34½ hours at $0.60 per hour or $20.70.

Formed on Jig

To overcome this we made a cheap jig of scrap angle iron to hold the side plates. Time required was 6 hours for cutting and welding. Cost was $4.62, including rod. Material included 22 feet of ¼ x 2 x 2-inch angle rough cut and arc welded together. Instead of cutting side plates to such close limits, the side plates were cut so they would lap one-half the thickness of the end plates. Side plates of the 25 x 30-inch jackets were cut 30⅛ inches long, and the end plates 25 inches long. Cutting time was 1 hour 30 minutes; the 10 degree accuracy was maintained by the jig. Corner angles were eliminated by welding corners full length 9 inches per corner, using small rod. With side and end angles in place on the jig for welding, welds were placed as shown on the illustration. Welding and assembling time for one man, 8 hours to do 40 feet of welding at $0.75 per hour or $6.00; rods $0.13; angle cutting time, 2 hours 40 minutes at $0.60 per hour or $1.60; square shear time, 1 hour 30 minutes, $0.90.

For the first eight jackets the time, including manufacture of jig, was 18 hours 10 minutes. This means a saving of 16 hours 20 minutes actual time over the old method. Cash saving less cost of jig was $7.45.

Improvements included a stronger, more accurate jacket requiring less upkeep since it does not spring out of shape, or at least has not for the past 6 months of hard use. Elimination of corner angles requires 32 less cuts. There is 24 feet less angle, no riveting, no shaping, no squaring, no drilling or countersinking. The next set of jackets can be made for less as the 6 hours required for jig manufacture can be deducted from actual time. Cost of materials is not listed as it is practically the same in both cases. On the smaller sizes from 10 x 12 to 18 x 22 inches we have an adjustable jig which makes even greater savings possible owing to flexibility of the jig.

From an article submitted in the Industrial Progress Award Program sponsored by the James F. Lincoln Arc Welding Foundation, Cleveland.

Applying Fluoroscopy To Inspection

(*Concluded from page* 123)

levels. Therefore, a person with good vision in the ordinary sense may not be able to discern small flaws on a fluoroscopic screen.

Eye Accommodation: Accommodation of the observer's eyes to darkness is probably the most important precaution for successful fluoroscopy. The most complete investigation of this subject that is available is a paper read before the Radiological Society of North America in December, 1941 by Dr. W. Edward Chamberlain of the Temple University Medical School of Philadelphia, entitled "Fluoroscopes and Fluoroscopy."

This paper goes into considerable detail on a physiology of the eye and the nerves comprising the retina, and explains that eye accommodation to darkness is considerably more than mere pupil dilation. According to Dr. Chamberlain, at least 30 minutes and preferably 45 minutes should be spent in total darkness before attempting critical fluoroscopic work.

Training and Experience: A fluoroscope is such a simple device that there is a very natural tendency to believe that anyone can look at a screen and analyze what appears there. In the case of gross imperfections, this is probably true, but seeking flaws on the order of 5 per cent or less and attempting to analyze such flaws requires the same type of training as that of the radiographer in studying film. Some companies have worked out a course of training for their fluoroscopic operators and one of the early steps in this training is a study of radiographic films.

Comfort and Future: It must be recognized that a fluoroscope operator responsible for detecting small flaws is under a serious physical strain. The greatest strain is, of course, on the eyes, but a high degree of concentration is required which is a strain on the entire system. It is important to prevent fatigue which would result in impaired vision.

Therefore, the operator should be permitted to sit rather than stand, and the chair should be comfortable and with good support for the back. It is also recommended that the shifts be of short duration, that is, not more than two hours at a stretch (perhaps only one hour) with a rest period of at least 15 minutes before going on duty again. During the rest period it is advisable that the observer wear dark goggles in order to retain his eye accommodation.

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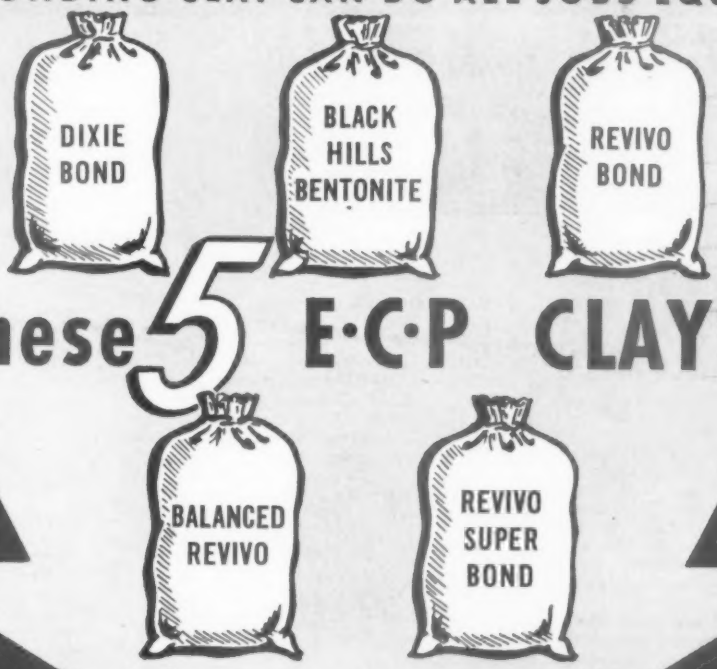

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(*Continued on page* 141)

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Secretary-Treasurer—G. L. White, West-

(*Continued on page* 144)

PRESENTING THE GAVEL: Frank E. Bates, outgoing chairman of the Western New York Chapter of the A.F.A., turns over the gavel to Reinhold D. Loesch, incoming chairman, at the chapter's annual meeting. Shown below at the same meeting are: (Seated, left to right)—Mr. Bates; Mr. Loesch; Elliot Jones, director; J. Ralph Turner, secretary; Martin O'Brien, director. (Standing, left to right)—A. J. Heysel; James L. Yates, director; Henry F. Sproull, director; Martin W. Pohlman, treasurer; Charles O. Burgess, director; Max Ganzauge, director; Ray Melville, director.

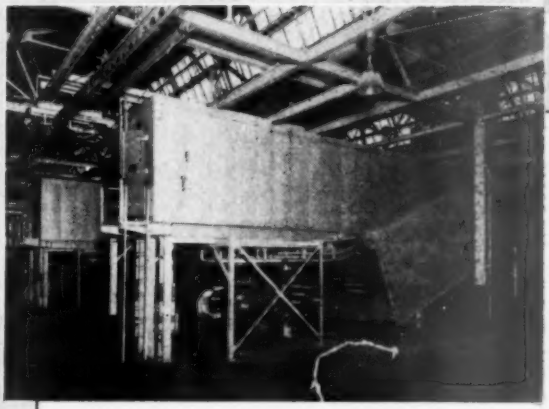
Photos by courtesy of A. J. Heysel, the E. J. Woodison Co., Buffalo

COLEMAN

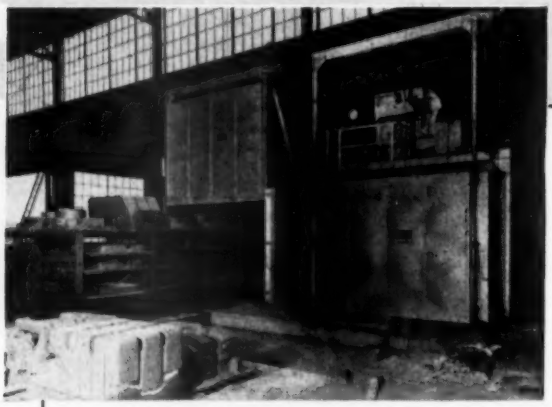
Critical

Coleman Rolling Drawer Core Ovens for speedy baking of small and medium cores.

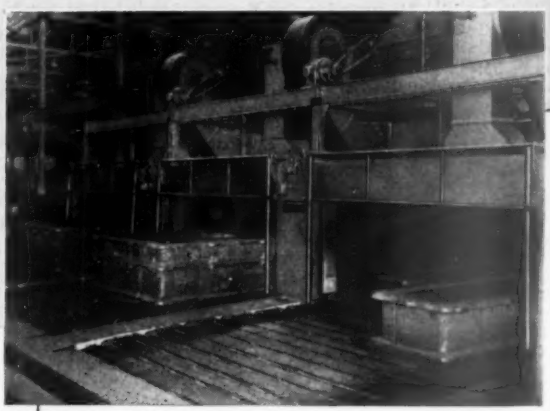
Coleman Transrack Core Ovens for operation with portable racks. Single or multiple rack capacity.



Coleman Horizontal Conveyor Core Ovens for large scale specialized production.



Coleman Car Type Ovens for baking big cores or drying molds. No job too large.



Coleman Conveyor Mold Ovens for high speed continuous drying of molds.

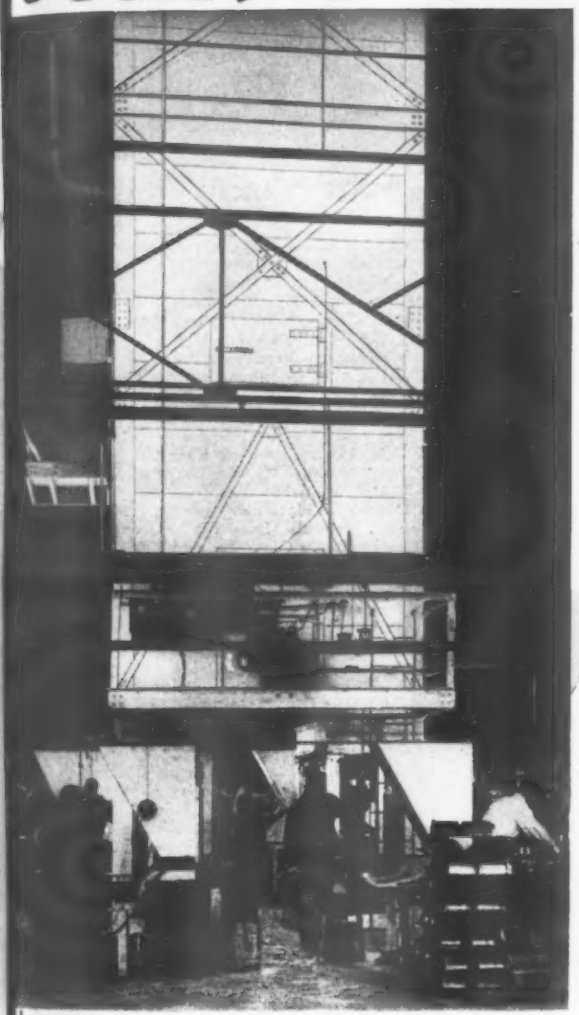
COLEMAN CORE AND MOLD OVENS

THE FOUNDR

BUILDERS OF COLEM

CLEVELAN

OVENS *Help Solve Man-Power Shortage*



Coleman Tower Core Ovens. Patented center passageway permits loading from inside as well as outside the tower and increases loading accessibility by as much as 300% compared with other designs of vertical conveyor ovens.

Hundreds of Coleman Ovens are serving as an effective means of meeting the critical man-power deficiency in foundries throughout the nation.

HOW IS THIS BEING ACCOMPLISHED?

- **By helping to turn out more and better work with fewer man-hours.**
- **By eliminating core rejects and make-overs.**
- **By reducing fatigue factor, and more efficient handling facilities.**
- **By reducing labor turnover as a result of better working conditions.**
- **By making work in the core department more appealing to today's labor.**

These and many more outstanding advantages of Coleman Ovens are available to foundries producing all classes of work.

The accompanying illustrations show some of the many types of Coleman Ovens built to meet all foundry requirements.

Over 40 years of specialization and know-how on foundry ovens are back of every Coleman Oven installation.

Write for Folio of Bulletins

QUIPMENT CO.
D SWARTWOUT OVENS
OHIO, U.S.A.

COLEMAN
CORE AND MOLD
OVENS

(*Continued from page* 141)

man Publications Ltd., Toronto, Ont.

Directors—W. J. Brill, Canadian General Electric Co. Ltd., Toronto; J. Dalby, Canada Metal Co. Ltd., Toronto; G. O. Loach, Otis-Fensom Elevator Co. Ltd., Hamilton, Ont.; L. B. Morris, The Gurney Foundry Co. Ltd., Toronto; T. Tafel, Standard Sanitary & Dominion Radiator Ltd., Toronto; R. A. Woods, Geo. F. Pettinos (Canada) Ltd., Hamilton, Ont.; J. A. Wotherspoon, Anthes-Imperial Ltd., St. Catharines, Ont.; C. O. Williamson, Grinnel Co. of Canada Ltd., Toronto.

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(*Concluded on page* 146)

"CENTRI-BLAST" WHEEL
(PATENTED)

The heart of the machine—a simple sturdy blasting wheel with four blades. It is mounted on a heavy shaft, equipped with roller bearings and V-belt drive—no moving parts inside of wheel. All parts in contact with abrasive are of highly wear-resisting alloy. The abrasive feed spout controls the direction of the blast.

CLEANS LARGE TONNAGE AT LOW COST

SLY "CENTRI-BLAST"

This Sly "Centri-Blast" Rotary Table cleans forgings and castings quickly and thoroughly.

The revolving table carries the parts to be cleaned through the blast chamber directly under the "Centri-Blast" (airless) wheel where they receive the full effects of powerful blasting.

In place of one large revolving table, the machine can be furnished with six 30" diameter auxiliary tables to accommodate a maximum load of 1,000 lbs. with variable drive and timing mechanism to rotate tables under blast. We shall be glad to furnish you complete data on each type with capacities and operating details upon request.

THE W. W. SLY MANUFACTURING CO.
4753 Train Avenue **Cleveland 2, Ohio**

SLY INDUSTRIAL DUST CONTROL

TUMBLING MILLS ★ BLAST CLEANING EQUIPMENT

(*Concluded from page* 144)

Chaplet & Mfg. Co., Milwaukee; Robert C. Woodward, Bucyrus Erie Co., South Milwaukee.

New England

APPROXIMATELY 80 members and guests attended the outing of the New England Foundrymen's Association held Aug. 10 at the Pawtucket Golf Club, Providence, R. I. Excellent weather afforded an opportunity for golf, quoits, and the annual soft ball game between the salesmen and foundrymen. A lobster dinner and special entertainment climaxed the day's program.

The next meeting of the association, to be held at the Engineer's Club, Boston, September 13 will include a round-table discussion on cupola melting with particular reference to the use of steel in the charge, which will be conducted by Charles Burkart, superintendent of Framingham Foundries, Framingham, Mass. —*Merton A. Hosmer, vice president.*

Connecticut

ANNUAL June outing of the Connecticut Non-Ferrous Foundrymen's Association was held at the Wilcox Pier Restaurant, West Haven, Conn., June 9, with an attendance of 284 members and guests. Through the kindness of various members and foundry supply representatives about 200 door prizes were made available. After dinner and the awarding of prizes, the group was treated to an enjoyable 2-hour floor show.

The committee responsible for the outing consisted of: Chairman, D. Wesley Case, Belknap Mfg. Co.; vice chairman, William R. Slater, Whitehead Bros. Co.; S. W. Chapell Jr., Electric Boat Co.; Herbert Z. Dingee, Springfield Facing Co.; Paul W. Trook, Joseph Dixon Crucible Co.; William L'Hommedieu, American Crucible Co., and Donald B. Mackay, Knapp Foundry Co. Inc.

The outing concluded a successful season for the association, which will resume its meetings in September.—*Donald B. MacKay, publicity committee.*

Wisconsin

DISPROVING the superstition that No. 13 may be a jinx, a record crowd of approximately 800 persons attended the 13th annual golf outing of the Wisconsin Chapter of the A.F.A., held July 21 at the new Ozaukee Country Club, Milwaukee.

The greater number of those present participated in the golf tournament during the day, for which merchandise certificates were awarded as prizes. War Bonds and stamps were given as prizes to participants of other contests throughout the day.

To climax the program, a delicious dinner was served buffet style, due to the help situation, and was followed by a very enjoyable floor show.—*Darold W. Thiem, publicity chairman.*

Birmingham

OFFICERS, directors and committee chairmen of the Birmingham Chapter of the A. F. A. attended an informal dinner tendered them by A. S. Holberg at the Bankhead Hotel, Birmingham, July 28. Among various plans made for the coming season it was voted to hold the thirteenth annual foundry practice conference of the chapter the week of Feb. 26, 1945.

It was suggested by Dr. James T. MacKenzie, program committee chairman, that regular monthly meetings not be scheduled for any fixed day or dates in order that his committee would have more latitude in obtaining speakers. The proposal was approved with the understanding that the meetings would be scheduled sufficiently in advance to permit giving ample notice to the membership. Plans were discussed for the annual picnic of the chapter to be held in September.—*J. P. McClendon, acting secretary.*

Apprentice Training Program Commended

Apprentice training program followed by the Skagit Steel & Iron Works Inc., Sedro-Wooley, Wash., has been singled out by the Apprentice-Training Service of the War Manpower Commission as representative of a comprehensive policy for the medium-size plant.

In a recent bulletin, "Training Teamwork," issued by the service, it is pointed out that the company also has a short-term training program for both men and women. The vocational division of the local high school provides pre-employment and supplemental training for its workers. In co-operation with the vocational authorities, the plant conducts a part-time school and work program for some of its younger apprentices. And it has found that satisfactory replacements for younger men gone into the armed forces may be obtained from the ranks of older men with families.

Skagit Steel & Iron Works, located 100 miles north of Seattle, employs about 425 workers, both men and women. It has a long and useful history in the logging industry, operating both cupola and electric furnaces and specializing in the production of iron and steel castings. Established at the turn of the century as a repair shop serving local mills and camps, it has grown steadily to become one of the largest plants manufacturing logging machinery on the Pacific coast. Until it transferred its attention more particularly to the manufacture of hoisting equipment for the armed forces, it was building such products as power hoists, yarders, gas units, engines, and mechanical equipment.

Workers are drawn principally from the neighboring agricultural districts, where many of them own small farms. In normal times, almost the entire working force is drawn from Skagit county; at present some 30 per cent come from more remote areas. There being practically no other major industrial establishment for miles around, there is no serious competition for labor; many of the employes (one in every eight) have been with the company more than 5 years, despite the fact that the working force has almost doubled since June, 1942.

As regards skilled labor, the company has little or no competition from other industries; the main problem is in the low-skilled and laboring groups, which are tempted by better wages elsewhere. To meet this problem, the company has developed an upgrading program especially attractive to the helper group, and is employing women, about 30 in all, in the machine shop and foundry.

Out of the 425 workers, approximately one-fourth are all-round skilled workers, 22 are apprentices, and 27 are trainees.

Even during its earlier history, the Skagit Steel & Iron Works employed apprentices, under an informal program of training. But, early in 1941, management and labor, recognizing the value of a formal program operating under state standards, inaugurated a formal training program.

The apprenticeship program operating under written standards approved by the Washington State Apprenticeship Council during April, 1942, provides for the training of machinist, patternmaker, molder and coremaker apprentices. The standards have been approved by Lodge No. 1496, of the International Association of Machinists; Local No. 311, of the Molders and Foundry Workers; and the Pattern Makers' Association, of Seattle and vicinity.

Guidance in the administration of the apprenticeship program is provided by the Joint Apprenticeship Committee of six members equally representative of management and labor; thus each of the three co-operating unions is directly represented. The owner-manager of the plant, although not a member of the committee, is nevertheless, its most enthusiastic supporter. The local superintendent of schools and an Apprentice-Training Service representative are consultants without vote. The director of training for the company, who administers the program, is a member without vote.

The committee meets regularly once a month, but individual members of the committee frequently discuss matters informally.

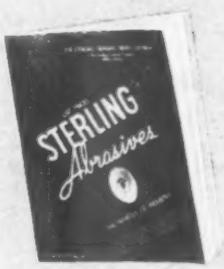
Foundry Equipment Backlogs Up

Unfilled orders for foundry equipment and supplies amounted to $8,983,000 at the end of May, against $8,441,000 the month before, according to reports to WPB by 45 companies responsible for about 93 per cent of the industry's total shipments. Backlogs one year previous totaled $10,513,000.

STERLING

THE WHEELS OF INDUSTRY

The Cards (*And Sterling Wheels*) Are Stacked Against Our Enemies!



Sterling Catalog No. 44 is just off the press, offering important information about old and new items that department heads will want to study. Ask for your copy on your letterhead and it will be sent at once.

Sterling workers are stacking the "Wheels of Industry" against the best effort our enemies can muster. We realize that battles cannot be won in factories, but that they can be lost there! We know, too, that there is hardly any product for war that does not depend upon excellent grinding to get it into action faster. That is why Sterling Grinding Wheels are going into our furnaces faster than ever before . . why, in spite of wartime difficulties, you are receiving your wheels quickly.

We believe it is worth a lot to have Sterling quality doing its share for victory in your plant. Hundreds of users of Sterling Grinding Wheels have seen them push up production and turn out better work. They have seen operator fatigue lessened and wheel-life lengthened. Costs, before and after Sterling Wheels are used, are the final, good reason for specifying them.

Case histories of what has happened in various industries after Sterling Wheels have been put on the job will be given you by our engineers. Take advantage of this experience in planning your production for war—or peace. Your letter will bring an engineer at no obligation. Write it today!

• STERLING ABRASIVES •

THE STERLING GRINDING WHEEL DIVISION
OF THE CLEVELAND QUARRIES COMPANY
TIFFIN, OHIO

THE WHEELS OF INDUSTRY

Each Grain
Gets SPECIAL ATTENTION
THE QUALITY OF THE BATCH DEPENDS UPON THE THOROUGHNESS OF THE MULLING PROCESS!
Speedmullor action assures that the entire batch of sand has received a fast and frequent application of pressure, agitation and aeration, producing a fluffy, well aerated sand without the means of any other auxiliary aerator. During its extremely short mulling cycle, the Speedmullor carries each sand grain through all the processing necessary to provide the proper texture and quality to the entire batch.
Speedmullor mulled sand is always uniform — always can be prepared exactly to your individual sand specifications. Discover for yourself the many advantages of this better mulling method—test the Speedmullor in your own foundry.

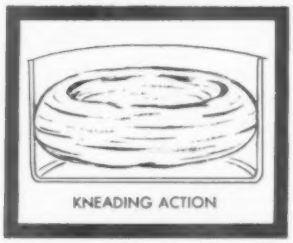
. . . When Mulled in the *Speedmullor*

The quality of your mulled sand determines the quality of your castings! For a clean, smooth, surface finish on castings, use the Speedmullor. It prepares the highest quality sand obtainable. It does the job faster and more economically...it reduces scrap losses and cleaning costs, and it makes amazing savings in core oil because its uniform mulling develops the greatest plastic strength and workability from the least amount of binder.

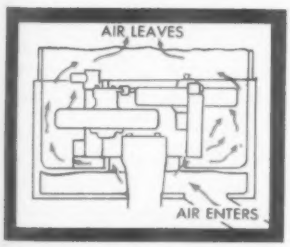
Investigate the Speedmullor method now!

SPEEDMULLOR ACTION PROVIDES THESE ADVANTAGES!

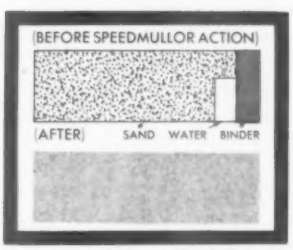
Speedmullor squeezes and kneads the sand between resilient rubber surfaces which last indefinitely because of their resistance to abrasive action.



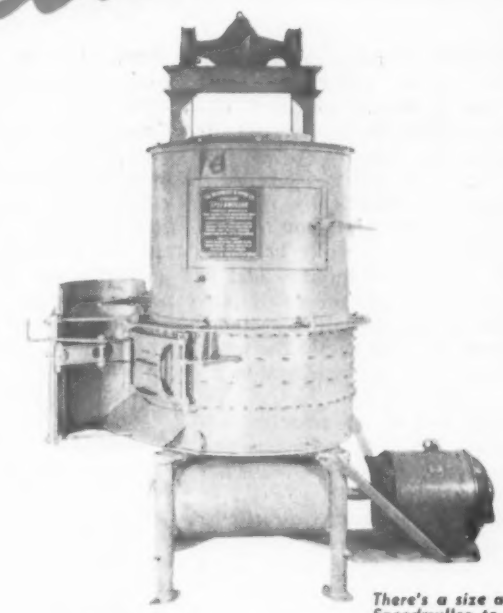
Speedmullor disperses the sand—holds it in suspension as it kneads and agitates . . . separating the grains and avoiding compact masses.



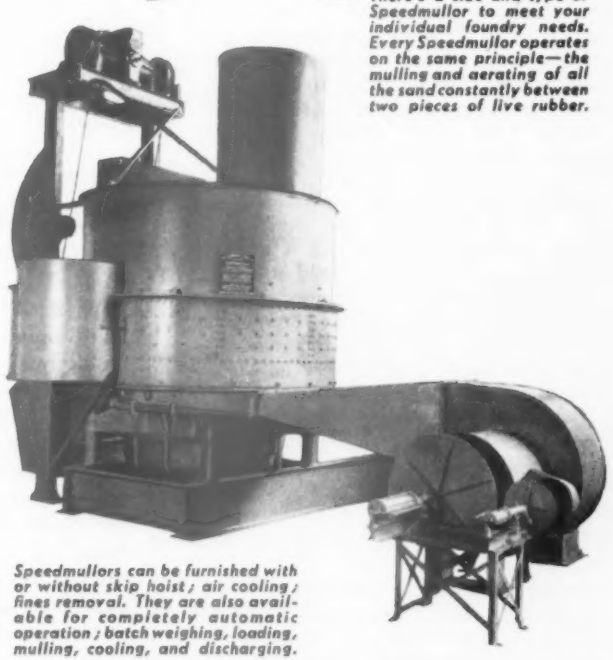
Air entering Speedmullor at bottom is forced through suspended sand, quickly cooling it to within a few degrees of room temperature.



Speedmullor causes rapid and continuous agitation of sand, binders and moisture. Constantly changing position, each sand grain becomes uniformly coated.



There's a size and type of Speedmullor to meet your individual foundry needs. Every Speedmullor operates on the same principle—the mulling and aerating of all the sand constantly between two pieces of live rubber.



Speedmullors can be furnished with or without skip hoist; air cooling; fines removal. They are also available for completely automatic operation; batch weighing, loading, mulling, cooling, and discharging.

A Beardsley & Piper engineer will be glad to call on you . . . explain the outstanding features of the Speedmullor. . . and recommend the best installation for your foundry requirements. This service involves no obligation, and there is absolutely no charge. We will welcome your interest . . . write us today!

THE BEARDSLEY & PIPER COMPANY

2541 North Keeler Ave. Chicago 39, Illinois

THE BEARDSLEY & PIPER COMPANY ARE MANUFACTURERS OF SANDSLINGERS, SPEEDSLINGERS, SPEEDMULLORS, SCREENARATORS, MULBAROS, SHAKE-OUTS, SAND CONDITIONING MACHINES, GYRATORY SCREENS

WASHINGTON Notes

FOUNDRIES desiring to prepare for postwar civilian goods production now are permitted to place unrated purchase orders for foundry equipment, melting furnaces, conveyors and most other types of major plant items. Permission granted recently by WPB to place such orders represents one of various steps taken to provide a basis for eventual reconversion of industry and to permit such limited civilian goods production now as may be possible without interfering with the war effort. The move does not cover new plant construction.

★ ★ ★

A company desiring to place an unrated purchase order for equipment first should obtain approval by writing a letter to its nearest WPB field office. This letter, in triplicate, should indicate the type of equipment desired, including make, size, and approximate price. WPB will attempt to locate the desired equipment in idle or excess stocks, but if unsuccessful will approve placing the purchase order. Machinery manufacturers who receive these unrated purchase orders may obtain permission to fill them by filing a form (WPB-3898) with their nearest WPB field office.

★ ★ ★

IF A PERSON wants to place an order for any type of equipment that will be used eventually to produce a product that may not be manufactured at present under WPB restriction, he may apply on form WPB-1319 for a preference rating with which to place his order if he cannot get assurance of delivery on an unrated order at the time he needs the new equipment. Naturally, all rated orders will be filled prior to any unrated orders, since the former constitute war or essential civilian requirements.

★ ★ ★

The other three steps taken by WPB for preliminary reconversion of industry include: Release of aluminum and magnesium for civilian manufacture, effective July 15; authorization of production of postwar experimental models, effective July 22; and lifting of restrictions of various "L" and "M" orders, effective Aug. 15. The latter orders are being eased at the discretion of regional WPB offices, which now are empowered to authorize civilian production on the basis of local supplies of manpower and materials. Individual manufacturers desiring to make civilian products heretofore banned by such orders, or to exceed existing quotas of items that may be made, must apply to WPB for approval before starting or increasing production.

★ ★ ★

RECENT shifts in the supply-demand status of various materials principally concern aluminum and magnesium. These light metals now are listed by the WPB Conservation Division in Group III—materials that exceed current war and essential industrial needs. In the scarcity classification are malleable iron and automotive gray iron castings. Except for the automotive type, gray iron castings generally are grouped with aluminum and magnesium.

★ ★ ★

Shifting of high urgency requirements to army tanks and components has brought the steel casting industry to the highest job referral level in those areas producing this materiel. However, steel castings generally are not in an extremely tight position, despite some manpower shortages and other unbalancing factors. WPB reports show that 355 steel foundries were operating as of Jan. 1, 1944, with total monthly output of about 220,000 tons.

★ ★ ★

ALTHOUGH surplus war property to be disposed of after victory may total around $50 billion, sale of only a $15 billion surplus is expected to be sought in this country. A large part of the remainder represents material and equipment already abroad which will be disposed of there. Considerable ordnance, raw materials, and some plants will be retained. Much equipment will have to be scrapped. But while there still will be a sizable surplus for sale, the Surplus War Property Administration does not contemplate our going out of the war business will precipitate anything like the chaos experienced in 1919.

★ ★ ★

Conditions are vastly different today compared with those 25 years ago. The last war ended with industry almost totally unprepared for contract cancellations, which came almost immediately, while plans for war property disposal currently are in a more advanced stage, and contracts are being cancelled gradually as military requirements decrease. Furthermore, the likelihood that the war may be terminated in two phases will tend to retard wholesale stoppage of war production.

★ ★ ★

SURVEY of wage-incentive plans in 86 foundry and forge shops shows that in 20 of these plants production increased 42 per cent when the more-work-more-pay principle was adopted, according to the WPB Management Consultant Division. The survey indicates that approximately 17,000 workers increased their earnings 18 per cent through the plans, while the shops reduced their unit labor costs 12 per cent. The report does not distinguish between the experience of the foundries and that of the forge shops.

★ ★ ★

Production cutbacks are not a significant problem so far as unemployment is concerned, according to a WPB study. Reviewing 216 cutbacks between June 15 and Aug. 1 it was found that only 14,925 workers out of a total munitions labor force of slightly less than 10,000,000 were laid off. In most instances the workers and equipment affected were absorbed quickly by other work in the same plants.

★ ★ ★

PRODUCTION of 88,000 electric ranges has been authorized for this year, about 16 per cent as many as were made in the year ended June 30, 1941. First companies to receive the go-ahead on this work include A. B. Stoves Inc., Battle Creek, Mich.; Frigidaire Division, Dayton, O.; Gibson Refrigerator Co., Greenville, Mich.; A. J. Lindemann & Hoverson Co., Milwaukee; and Malleable Iron Range Co., Beaver Dam, Wis.

★ ★ ★

Rationing restrictions have been removed on coal-wood laundry stoves. Supply of these stoves, usually made of gray iron, is said to be sufficient to meet demand.

★ ★ ★

INCREASED production of parts for domestic laundry equipment and domestic sewing machines for repair and replacement purposes is in prospect.

(*Concluded on page* 153)

Foundry Reports: **OPA calls attention to the fact that June 30 quarterly reports now are past due from firms exempt from RMPR 125 (Nonferrous Castings) because of the small volume of their sales and from firms claiming exemption for small orders. Foundries selling less than $12,500 worth of nonferrous castings in the preceding quarter should have filed by July 20 Form OPA 677:115a—or a letter reporting the quarter's net sales of all products; net sales of nonferrous castings made in sand, semi-permanent or permanent molds, and the number of employes on the foundry's payroll for the last week of the quarter. Foundries who took advantage of the price exemption on small orders for nonferrous castings should have reported by July 15 for the second quarter the total weight and dollar volume of castings of each metal base sold under this exemption, also weight and dollar amount of all nonferrous castings priced under RMPR 125.**

Ship to—
Nearest Foundry
desiring:
1. Increased mold production to speed War Program.
2. Lower unit mold cost.
3. Molds that produce perfect castings.
4. Lowest operating and maintenance cost.
ARMY
E
NAVY
MOLDING HERMAN MACHINES
HERMAN PNEUMATIC MACHINE CO., UNION BANK BUILDING, PITTSBURGH, PA.

WITH THESE POWERFUL

Thor

AIR GRINDERS

...YOU'LL WASTE NO TIME ON GRINDING

To give you top speed for peak production grinding . . . to give you precisely the type of power, light weight, and extreme stamina that make it possible, THOR Air Grinders have these advanced construction features:

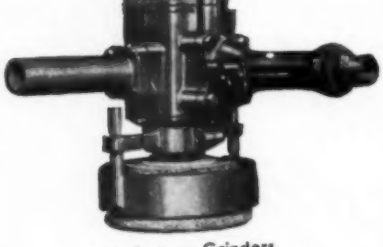
1. THOR "Air Behind the Blades" principle keeps the rotor blades out against the cylinder bushing wall, preventing dead center position and assuring *instant starting* under all operating conditions.
2. The solid one piece construction of the THOR rotor permits the use of deeper blade slots and wider blades. This greatly boosts the power and the rate of material removal.
3. The THOR Double-Acting Safety Governor acts to save time in two ways: It regulates spindle speed to the level of highest grinding efficiency for the size and type of wheel used. It prevents racing of wheels at dangerously high speeds even in event of mechanical failure of governor parts.

You will find these top speed construction features, plus others like THOR End Exhaust, Automatic Lubrication, and Labyrinth Seal on Spindle, in a complete line of THOR Air Grinders for every industrial application. For details, write for THOR Pneumatic Catalog No. 52B.

50 Thor Air Grinders For Every Type Of Job!

Thor Small Wheel Grinders

Thor Radial Wheel Grinders



Thor Surface Grinders

LOOK AT THE RANGE!

Number of Models	50
Wheel Capacities	1½" to 8" dia.
Speeds	3000 to 21,000 RPM
Lengths	5½" to 39"
Weights	18 oz. to 24 lbs.

Thor *Portable Pneumatic and Electric Tools*

INDEPENDENT PNEUMATIC TOOL COMPANY

600 W. JACKSON BOULEVARD, CHICAGO, ILL.

Branches in Principal Cities

(*Concluded from page* 150)

Each manufacturer now is permitted to carry in stock twice as many parts of each type as he sold during the second preceding quarter. Formerly such inventories were limited to the number sold the first 6 months of 1943.

★ ★ ★

Restrictions on type of metals used in fire protective, signal and alarm equipment have been relaxed. Copper and copper base alloys again are permitted for hose line fittings and fire hose couplings, a changeover prompted chiefly because of the shortage of malleable iron castings.

★ ★ ★

INDUSTRY gave a lot of advice to WPB during the first half of this year. There were 764 meetings with industry advisory committees, involving more than 8000 business men and women. While the Steel Division consults with 45 different committees and 36 groups advise WPB on general industrial equipment, the Textiles, Clothing and Leather Bureau hears from 123 committees. Wonder how much of the advice was heeded.

W. G. G.

OBITUARY

EDMUND H. LUNKEN, 83, chairman of the Lunkenheimer Co., Cincinnati, valve manufacturer, died at his summer home in Michigan, July 19. The son of Frederick Lunkenheimer, founder of the Lunkenheimer Co., he was born and educated in Cincinnati. At the age of 16 he entered his father's business, which had been established in 1862. In 1889, upon his father's death, Mr. Lunken assumed leadership of the company. In 1892 he legally changed his surname to Lunken, although the name of the company remained unchanged.

° ° °

Edward Bausch, 89, chairman of the board, Bausch & Lomb Optical Co., Rochester, N. Y., died July 30. In 1871 he entered Cornell University on a scholarship and in 1874 entered the optical business of his father, John Jacob Bausch. His activity in the development of the microscope, laboratory instruments and centrifugal testing machines was evidenced by a succession of patents. In 1888 Mr. Bausch went to Europe to study and observe design and the manufacture abroad of microscopes and instruments. In 1905 he joined Bausch & Lomb.

° ° °

Dr. Frank Jerome Tone, 75, chairman of the Carborundum Co., Niagara Falls, N. Y., died July 26. After his graduation from Cornell University he was employed by Thomson-Houston Electric Co., Lynn, Mass., and by the Pittsburgh Traction Co. as an engineer. In 1895 Dr. Edward G. Acheson moved his abrasive plant from Monongahela, Pa., to Niagara Falls, and Dr. Tone was engaged as plant engineer. An intensive study of the properties of abrasives as well as the processing and the development of grinding wheels followed. In 1919 Dr. Tone was elected president of the Carborundum Co. and in 1942 was named chairman of the board of directors.

° ° °

George B. Glassford, 41, purchasing agent for the Lindberg Engineering Co., Chicago, since the company was established in 1937, died July 13 in that city. From 1929 to 1937 he was purchasing agent for the Claud S. Gordon Co., Chicago.

° ° °

William L. Glass, 72, formerly foundry superintendent, Deming Co., Salem, O.,

WILLIAM L. GLASS

died May 2. He had been employed by the Deming Co. for 47 years, until his retirement in 1941.

° ° °

George C. Purdy, chairman of Greenlee Bros. & Co., Rockford, Ill., died July 2. Mr. Purdy had been associated with the company for more than 50 years and served as its president from 1919 until 1943.

° ° °

Richard Fawbert, 55, foundry foreman of the A. L. Swett Iron Works, Medina, N. Y., died Aug. 9 in that city. Mr. Fawbert was born in Bradford, England, and served his apprenticeship in that country. After coming to the United States he was employed for 21 years in the foundry of the Davis & Furber Machine Co., North Andover, Mass., and for 4 years was foreman of the steel foundry of Simonds Saw & Steel Co., Lockport, N. Y. He joined the A. L. Swett Iron Works as foundry foreman in 1938.

° ° °

Francis P. Gormely, 56, president of Electro Metallurgical Co., Haynes Stellite Co., Michigan Northern Power Co. and several other units of Union Carbide & Carbon Corp., New York, died July 13 at his home in New Rochelle, N. Y. Mr. Gormely had been associated with various subsidiaries of Union Carbide since his graduation from the University of Michigan in 1909. He assumed the presidency of the companies only a few months ago.

° ° °

Edgar H. Bristol, 73, president and one of the founders of the Foxboro Co., Foxboro, Mass., died July 24 at his summer home at Falmouth Heights, Mass. A native of Naugatuck, Conn., he entered the foundry industry as a machinist at the completion of his high school education, later becoming a toolmaker and subsequently production manager of the instrument company of which his father was president. In 1908 he and his brother, Bennet B. Bristol, organized the Industrial Instrument Co., which in 1914 became the Foxboro Co.

° ° °

John F. Klingel, general superintendent of the Buffalo Foundry & Machine Co., Buffalo, died July 15 in that city. He had been connected with the company 35 years.

° ° °

William H. Smith, 74, president of the Ohio Foundry Co., Cleveland, died July 11 in that city. He was also president of the W. M. Pattison Supply Co., Cleveland.

° ° °

John Beller, retired master mechanic of National Malleable & Steel Castings Co., Cleveland, died there July 12.

° ° °

Percy L. Bowser, 59, executive vice president and general manager of Sterling Aluminum Products Inc., St. Louis, died unexpectedly Aug. 1 while returning from a business trip to Chicago.

° ° °

Percy I. Matthews, proprietor of the Matthews Foundry, Fresno, Calif., died July 24 in that city. Mr. Matthews became head of the foundry in 1934 after the death of his father who founded the business.

° ° °

S. William Sigler, 51, president and treasurer, Aetna Core Sand Co., Chicago, died Aug. 4 in that city.

Booklet Discusses Foundry Costs

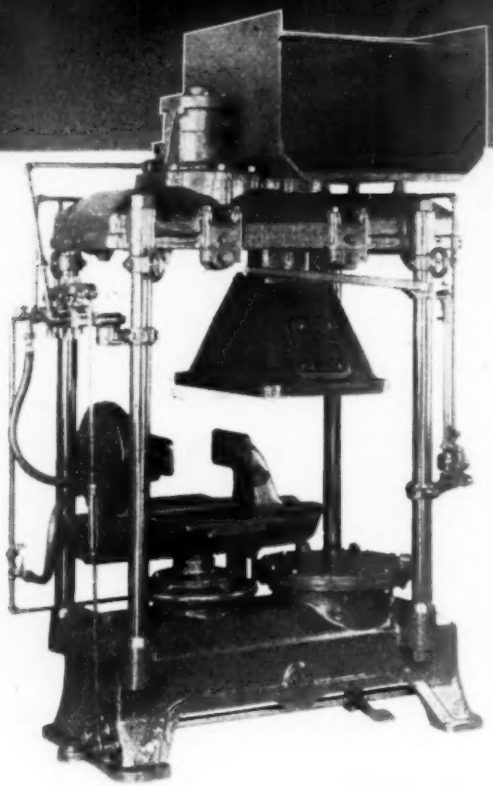
The Association of Brass & Bronze Founders, Birmingham, England, has published a booklet on "Standard Costing and Cost Control" as adapted by the Phosphor Bronze Co. Ltd., Birmingham. This booklet is a compilation of lectures presented before the formation meeting of the association June 29, 1943. The subject matter is presented under the following heads: "General Introduction," by G. T. Hyslop, managing director, Phosphor Bronze Co.; "Standard Cost and Cost Control," by A. N. Wormleighton; "Time Study for the Foundry," by A. E. Ball; "Standard Costs—Financial Accounts and Control," by D. L. Roome, A. C. A.; "Standard Costs—The Sales Angle," by W. Smithson.

The present cost system, with certain modifications to suit local conditions, was first introduced to the Phosphor Bronze Co. in 1936 by P. J. Flaherty, Johnson Bronze Co., New Castle, Pa. Presentation of the material in the present booklet is exceptionally complete in text and illustration of the various cards necessary in the operation of the system. As outlined by one of the participants the system aims at finding what the cost should be, and not what the actual cost of any given article is. It determines the cost before the commencement of operations and not after they are finished.

INTERNATIONAL *Sand Blowers*

are designed for Speed in Operation, Ease of Handling, and for the making of BETTER CORES.

There is an INTERNATIONAL Sand Blower to fit your every need. A call will bring an INTERNATIONAL Service Man with wide foundry experience to help you solve your core making problems.

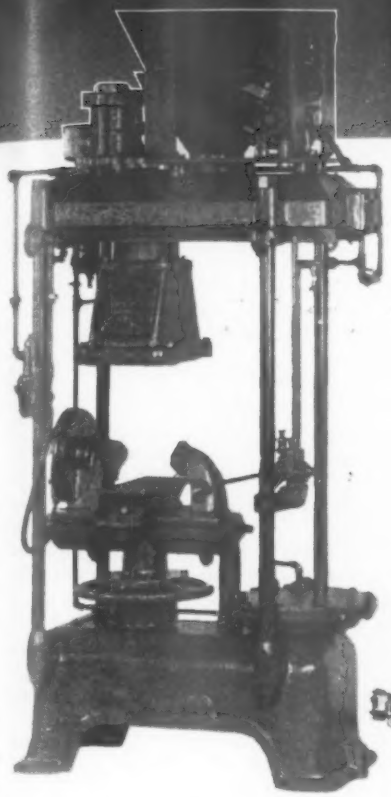


Type SB12—Adapted for large split boxes.

Type SB5 Sand Blower, adapted especially for small vertically split boxes.

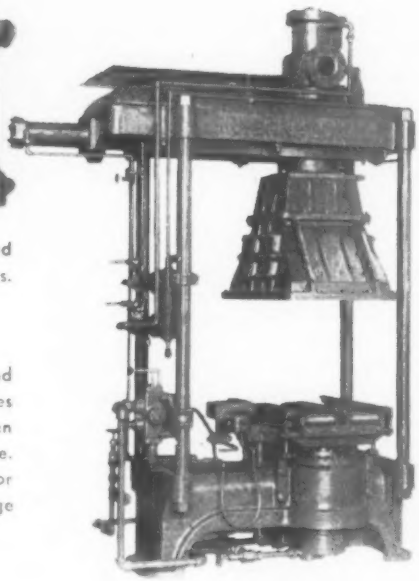
Type SB11—For medium sized cores with air clamp and draw feature.

Type SB7 Sand Blower, adapted especially for small horizontally split boxes.

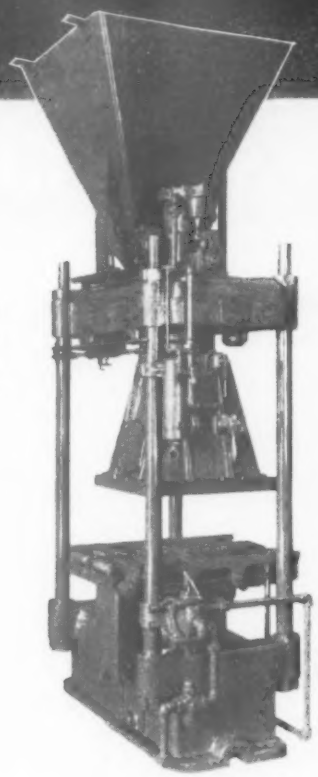


Type SB10—Sand Blower, adapted especially for medium size split boxes.

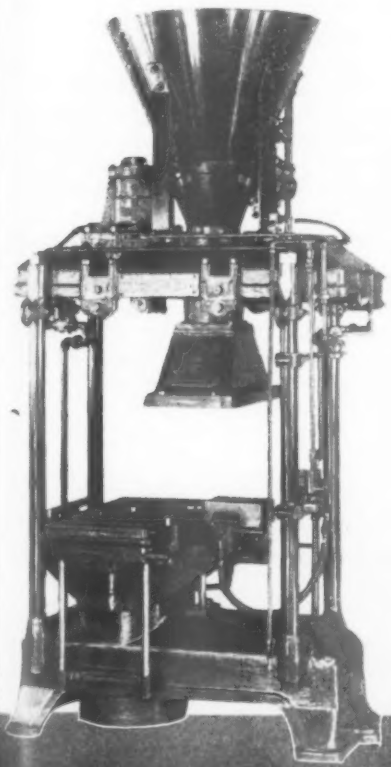
Type SB13—Sand Blower adapted especially for horizontally split boxes of medium size, but larger than can be handled by the **SB11** machine. May be had with the roll-out conveyor feature for ease in handling large core boxes.



Type SB15-H is adapted for the making of extra large Cores. Hydraulic clamp and draw feature.



Type SB17-H Sand Blower is the right machine for blowing those Super-Cores weighing up to 350 lbs.



INTERNATIONAL

Sand Blowers and Molding Machines

are busy in every part of the country, working on High Production schedules turning out the tools of war. INTERNATIONAL engineering ability is helping to spell out in large letters:

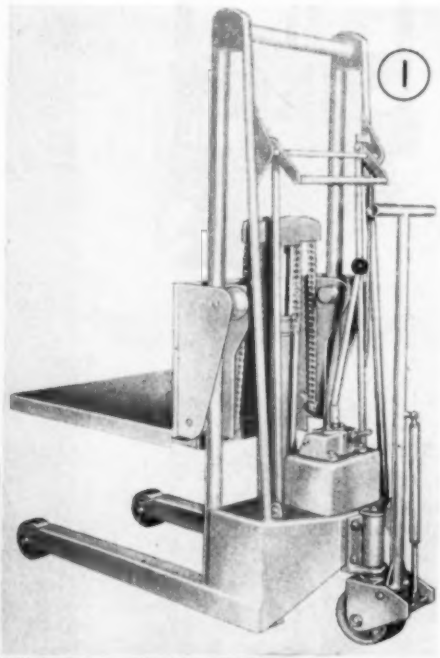
* * * * * VICTORY! * * * * *

INTERNATIONAL MOLDING MACHINE COMPANY

2608-2624 West Sixteenth Street * Chicago 8, Illinois

NEW EQUIPMENT & SUPPLIES

(1)—High-Lift Truck: Lyon-Raymond Corp., Greene, N. Y., is introducing a new combination hydraulic high-lift truck and tiering machine. It is made of tubular and formed steel and weighs only 495 pounds. The unit turns readily within its own length. It is equipped with a powerful floor lock and has a controlled fingertip lowering device. The standard stock model has a capacity of 1000 pounds with 24 x 30-inch platform and raising range of 42 inches—from 6 inches lowered to 48 inches elevated. It also can be supplied to meet other specifications.



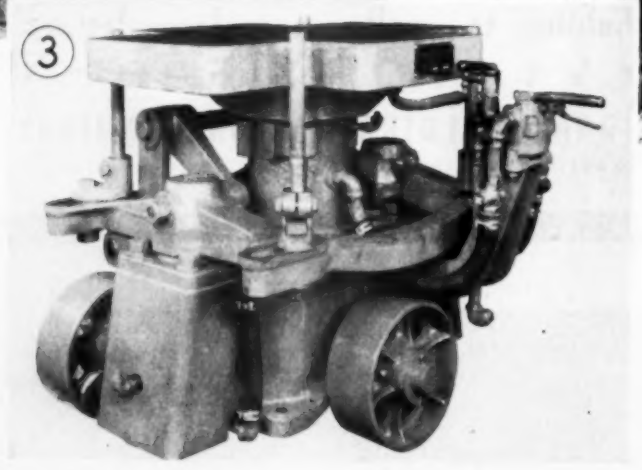
(2)—Sawing Machine: Continental Machines Inc., 1301 Washington Avenue South, Minneapolis 4, announces a new high speed sawing machine. It features a 36-inch throat depth and 20-inch work thickness capacity. Speed range between 1500 and 10,000 feet per minute is controlled infinitely by a variable speed pulley. A "job selector dial" shows the saw control factors for shaping 104 basic materials, including nonferrous alloy castings, cast iron, and alloy steels. Hydraulic brakes on upper and lower wheels and steel housing for all moving parts protect the operator, who has all operating controls within easy reach. Extreme rigidity in the frame assists precision operation of the machine. Standard equipment includes a 10-horsepower variable speed drive, a 30 x 30-inch work table with a secondary table extension 17 x 20 inches, and a four-way table tilt, 45 degrees to the right and 10 degrees to the left, front and rear.

(3) — Molding Machine: Johnston & Jennings Co., 877 Addison Road, Cleveland, announces a portable jolt stripper molding machine designed especially for making copes. The machine may be furnished either as a portable or stationary unit. It has a valveless, shockless jolt, free from rebound. The draw is positive and the speed of the draw can be regulated to meet different requirements. Lift pins can be adjusted easily and quickly for different size flasks. All working parts are fully enclosed, and all important bearing surfaces are provided with removable bushings to reduce wear, cost and time of making repairs and assuring long service. Specifications include: Table size 24 x 30 inches; maximum flask size 28 x 36 inches; pattern draw 8 inches; capacity at 80 pounds air pressure 600 pounds; diameter jolt cylinder 6 inches; diameter of two draw cylinders 3½ inches; weight crated 1350 pounds.

(4)—Safety Goggle: American Optical Co., Southbridge, Mass., is offering a new small-size eyecup safety goggle for women chippers. Light in weight, the goggle is sturdily made for protection against flying objects coming from any direction. Each eyecup is designed individually to fit the orbit of the eye. There are broad bearing surfaces for comfort, and the goggle is set low for wide angle vision. It has an insulated ball-chain bridge which can be adjusted easily and quickly. The headband also is adjustable.

(5)—Separator: Selas Corp. of America, Erie Avenue and D Street, Philadelphia 34, employs a different principle in its new separator for automatically and continuously removing condensate from compressed air and gas lines. No moving parts are involved, and the drain line is open to the atmosphere. Compressed air entering the unit passes through a water-repellent, porous ceramic tube where it is stripped of moisture. Coalesced moisture on the surface of this tube drops to the bottom of the unit

(*Continued on page* 158)



BAR OF *What?*

Carbon, graphite, or "Karbate" material* ...of course!

Corrosion resistance. Carbon and graphite are inert to all but highly oxidizing conditions, and to most acids, alkalies and solvents.

Absence of contamination. Carbon and graphite are insoluble and are not picked up in caustic and spin bath solutions.

Resistance to thermal shock. Carbon and graphite do not spall or crack even under sudden and extreme changes of temperature.

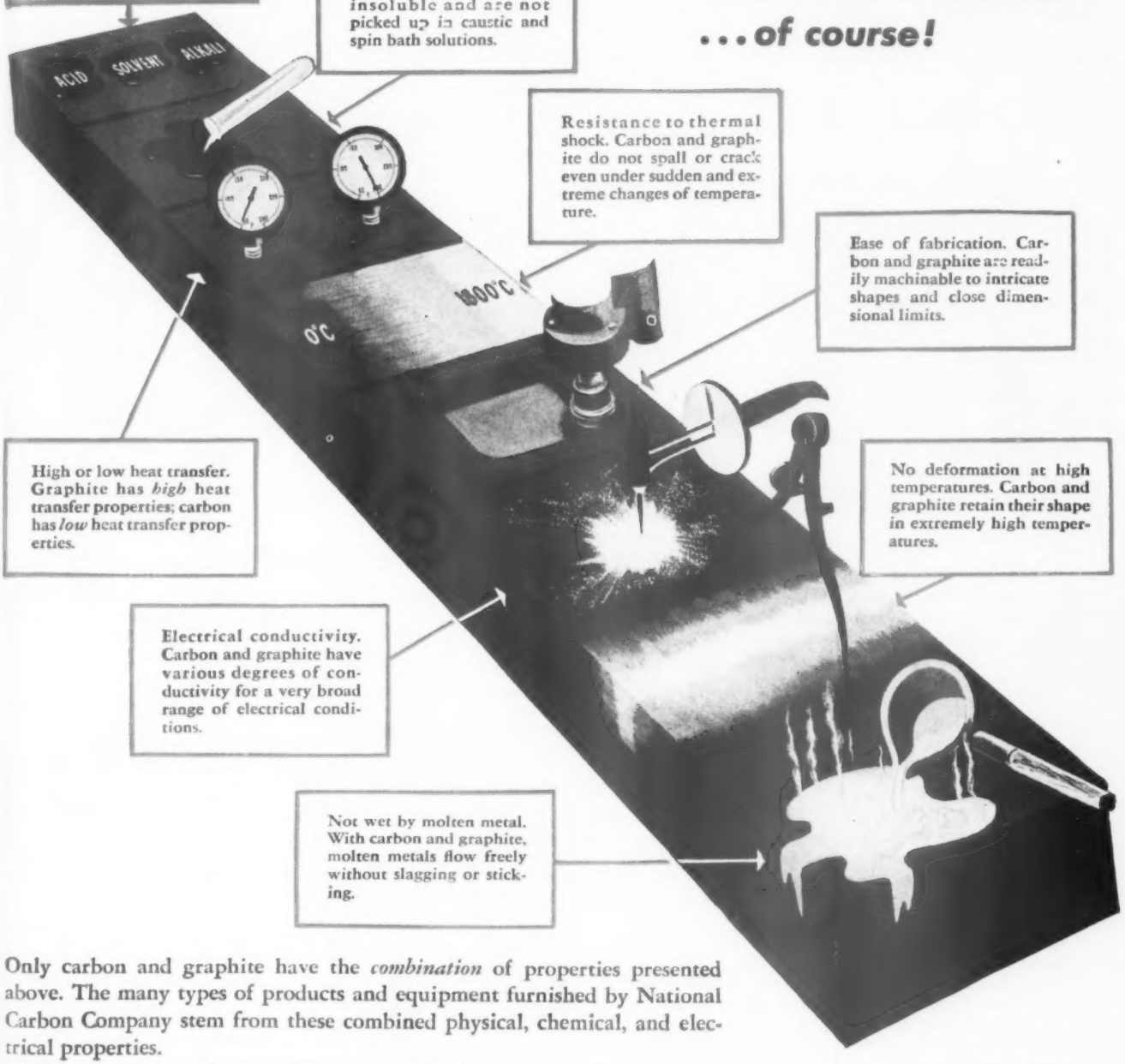
Ease of fabrication. Carbon and graphite are readily machinable to intricate shapes and close dimensional limits.

High or low heat transfer. Graphite has *high* heat transfer properties; carbon has *low* heat transfer properties.

No deformation at high temperatures. Carbon and graphite retain their shape in extremely high temperatures.

Electrical conductivity. Carbon and graphite have various degrees of conductivity for a very broad range of electrical conditions.

Not wet by molten metal. With carbon and graphite, molten metals flow freely without slagging or sticking.



Only carbon and graphite have the *combination* of properties presented above. The many types of products and equipment furnished by National Carbon Company stem from these combined physical, chemical, and electrical properties.

We urge you to study them. They not only make possible the present applications but are constantly suggesting new ones.

Many of these applications can further improve your manufacturing operations by decreasing interruptions, speeding up output, and cutting production and maintenance costs.

★ BUY UNITED STATES WAR BONDS ★

The word "Karbate" is a registered trade-mark of National Carbon Company, Inc.

*Carbon or graphite made impervious to seepage.

NATIONAL CARBON COMPANY, INC.

Unit of Union Carbide and Carbon Corporation

UCC

General Offices: 30 East 42nd Street, New York 17, N. Y.

Division Sales Offices: Atlanta, Chicago, Dallas, Kansas City, New York, Pittsburgh, San Francisco

(*Continued from page* 156)

where it passes through a second tube which is water-permeable but air-impervious. The model illustrated accommodates lines up to ⅜-inch pipe sizes with line pressures up to 100 pounds per square inch. Other sizes now are being perfected.

Dumping Hopper: Yale & Towne Mfg. Co., Philadelphia 24, has developed a self-dumping hopper consisting of an all-metal skid bin with hinged bottom. It can be picked up and moved by hand-lift truck, but the dumping operation can be accomplished only when the hopper is employed with an electric fork truck. Dumping is done by elevating the hopper by means of the

truck forks until the bin handle engages with a positive-action catch at the top of the truck elevating column. The forks then are lowered, leaving the hopper suspended. The unsupported hinged bottom opens, allowing the contents to pour out. The empty hopper is released from the catch on the elevating column by raising the forks, and the feed hopper then is lowered on the forks.

Gear Reducer: Cleveland Worm & Gear Co., Cleveland, announces a new gear reduction unit incorporating a fan cooling system which permits a reduction in size of the unit required for a given horsepower output. It incorporates a double wall construction which provides an air passage completely enveloping the oil reservoir in which the gear operates. The oil reservoir housing is deeply finned to increase heat dissipation. Air passage between the walls is intensified by an exhaust fan located on the coupling end of the worm shaft.

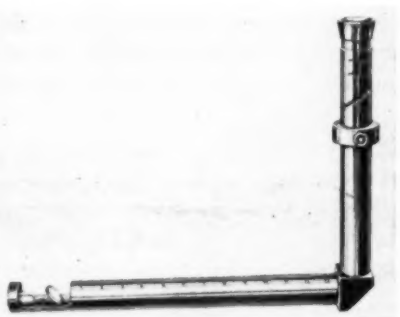
Cast Tool Tips: Haynes Stellite Co., Kokomo, Ind., has made available tool tips cast from cobalt-chromium-tungsten alloys for those desiring to fabricate their own metal-cutting tools. Metal-cutting tools made by brazing the tips to steel shanks are recommended for jobs employing tools of large cross sections, those that are bent or offset, or in tool holders which make use of solid tools impractical. The tool tips made in ten standard shapes of ten standard sizes are said to provide red-hard, abrasion resistant cutting edges. Bottom and one end of the tips can be supplied with or without bronze-tinning for brazing.

Gas Proportioner: Air Reduction Sales Co., 60 East Forty-Second Street, New York 17, has developed a proportioner designed to produce an accurate mixture of gases used for protective atmospheres in heat treating and other operations, at a pressure not over 5 pounds per square inch. The device consists of a mixing block incorporating accurately sized orifices on which are mounted flowmeters, pressure gages and needle valves for the gases, as well as inlet and outlet nipples. It can be furnished with any two of six available flowmeters permitting a wide variation in the proportions of the two gases to be mixed.

Damper: Thermix Engineering Co., Greenwich, Conn., is introducing a new damper which employs two curtains for regulating gas flow in either direction. The curtains are tied together to operate simultaneously, this permitting flow in either direction regardless of damper position. Use of damper of this type in a natural draft by-pass around fans, or in a heat or dust regulator equipment, provides complete isolation of the equipment for maintenance purposes. Elimination of recirculation also gives increased capacity and heat absorption, reduces banking losses and gives accurate regulation of natural draft.

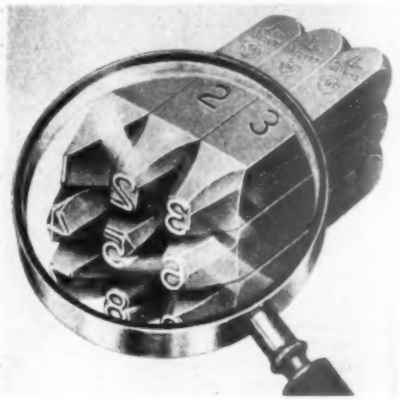
Welding Electrodes: Allis-Chalmers Mfg. Co., Milwaukee 1, announces a new line of both alternating and direct current type welding electrodes with quiet arc characteristics. The electrodes use the standard American Welding Society number and color, simplifying selection and handling.

Borescopes: Polan Industries, 832 Fifth Avenue, Huntington, W. Va., is making available to private industry its borescopes designed originally for the internal surface inspection of gun bores. The instruments, covering a diameter



range from 13/16-inch to 9 inches and a bore length up to 30 feet, combine the qualities of a highly corrected lens system and of excellent interior illumination with the demand for rugged design which is necessary for every-day shop use. The instruments will supply a clear and magnified view of bore surfaces, and do not strain the inspector's eyes when operated continuously. No special operator training is required. A number of special attachments for use with the straight standard borescope are available. Illustrated is a borescope with right angle eye piece extension.

Stress Stamping: H. Matthews & Co., 3942 Forbes Street, Pittsburgh 13, recently has designed a new style of rounded face characters for engraving on steel stamps, steel dies, and type for marking of parts placed under tor-

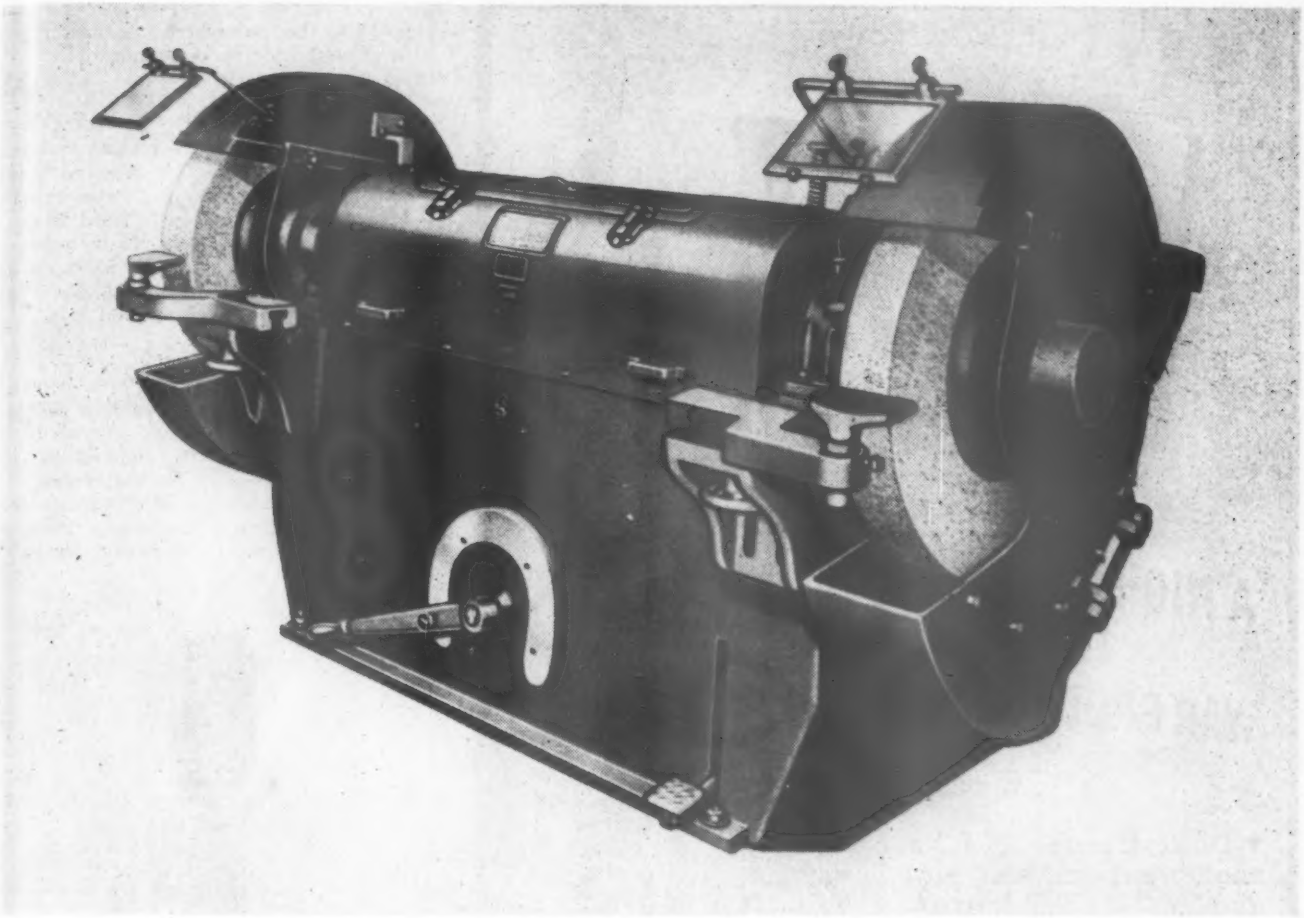


sion, bending or any combination of these, or where heat treating is accompanied by cracking or breaking due to stress concentration incident to conventional marking with sharp face stamping tools. The new design can be supplied in stamps, dies or type holders to control the depth of the mark.

Traveling Platform: Cleveland Tramrail Division of the Cleveland Crane & Engineering Co., Wickliffe, Ohio, has developed a rigidly stabilized traveling platform that can be raised or lowered without swing as firmly as though held by vertical guides. The device was developed originally for spray painting large air cargo ships and to aid in some assembly operations. The all-welded steel construction unit will carry a load of 5 tons and has a hoisting speed of 18 feet per minute. It may be operated vertically up to 30 feet and can be furnished for operation at any speed from creeping to 50 feet per minute or more.

Battery: Philco Corp., Trenton 7, N. J., has developed a new explosion-proof storage battery for particular use where any fire or explosion hazard exists. The explosion-proof compartment is constructed so that an air cylinder discharges into the space above the battery itself at a predetermined rate so that as the air and gases from the battery ex-

(*Continued on page* 160)



Designed to Furnish Additional Power
Gear Driven . . . 30 or 40 H.P.

HEAVY DUTY SNAGGING GRINDER

THE variable speed enables the operator to maintain peripheral speed for the full life of the wheel which is accomplished through semi-enclosed constantly lubricated gear reduction. Change in speed is very rapid with foot pedal and shifting lever which is interlocked with guards so that it is impossible to increase speed unless wheels are worn down sufficiently to justify speed change.

The Good Mechanics' Choice

THE one-piece chrome manganese steel grinding wheel spindle is supported by four heavy duty ball bearings enclosed in dust-proof housing, protected inside and out by labyrinth seals. Push-button control with overload protection and low voltage release. Boiler-plate adjustable wheel guards.

Write for complete details and deliveries.

The UNITED STATES ELECTRICAL TOOL Co.
CINCINNATI, OHIO

DUST CONTROL

A MIGHTY FORCE IN WAR PRODUCTION

• Dust Control *is* "a mighty force in war production,"—a silent partner to the mammoth machines, roaring furnaces, striving men and women. Behind the scenes in thousands of war plants and arsenals, that intrepid guardian —Dust Control—is doing a man-size job in keeping the ravages of industrial dust, soot and grime from vital machines, materials and workers.

• Such an important job as this must be complete. There is no room for partial Dust Control—for a job half done. That is too costly to meet the demands of modern industrial progress.

• Pangborn Dust Control, the result of forty years experience and research in answering industry's needs, will assure complete and exacting coverage for *your* dust problem. Use Pangborn facilities today and be sure of the best in Dust Control.

Original "E" Award received March 13, 1943. Renewal of award with white star added to banner November 5, 1943.

"Pangborn Dust Control is Protection for Production"

PANGBORN

WORLD'S LARGEST MANUFACTURER OF DUST COLLECTING AND BLAST CLEANING EQUIPMENT

PANGBORN CORPORATION · HAGERSTOWN, MD.

(*Continued from page* 158)

haust to the atmosphere, the mixture is so diluted as to be noncombustible.

Welding Tool: Atlas Welding Accessories Co., 14824 Wyoming Avenue, Detroit 21, is offering an improved weld cleaning tool combining a wire bristle brush and a slag removing head in one unit. The brush is removable for reversing or replacement, and the handgrip is permanently welded to the handle. The chipping head is made of tool steel.

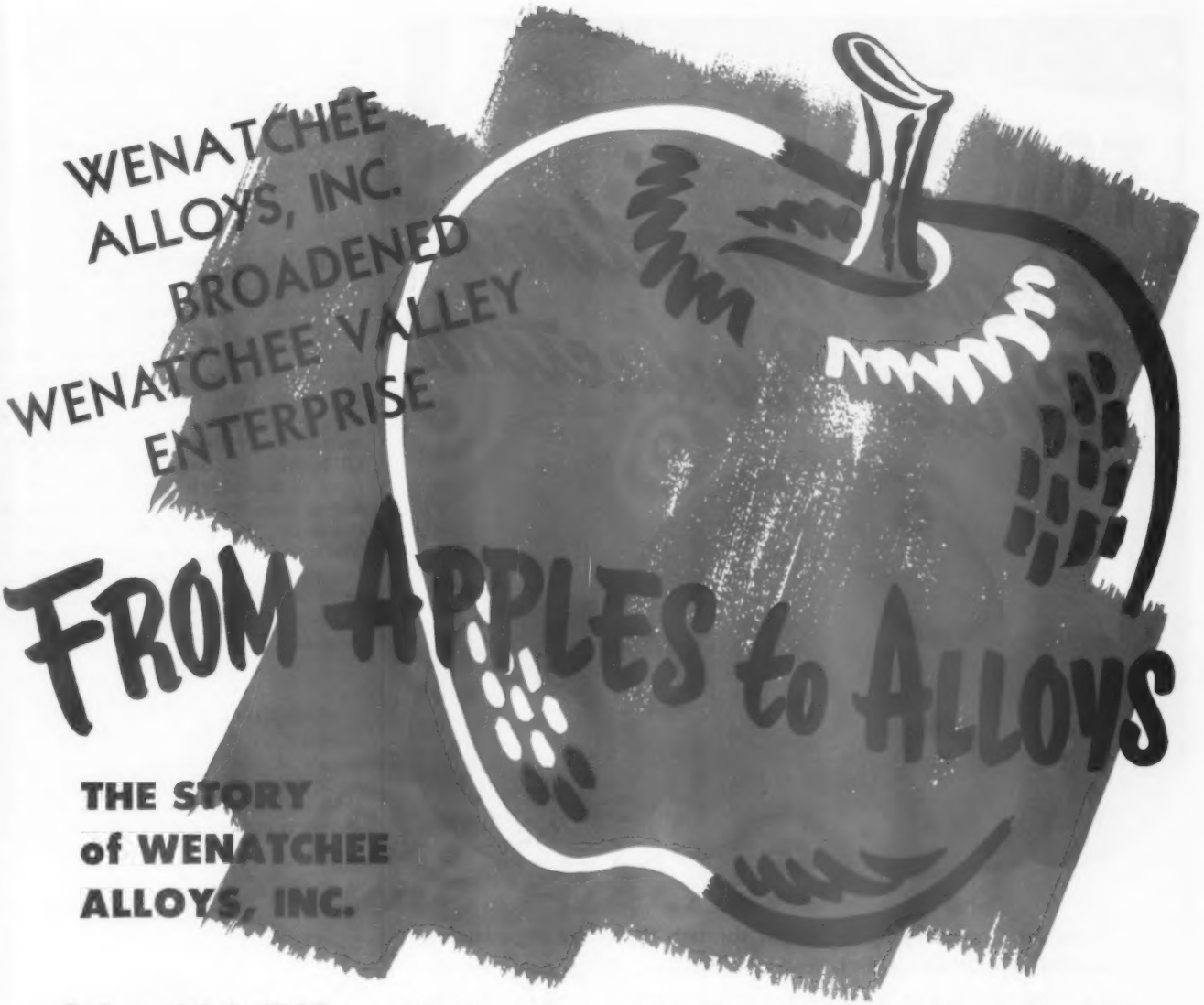
Controller: Electro-Mechanical Division of Manning, Maxwell & Moore Inc., Bridgeport 2, Conn., announces a new controller which combines seven devices into one unit for the control of compressor operations. It eliminates the necessity of using pipe and pipe fittings. The unit is made in ½, ¾ and 1¼-inch

sizes, the size being determined by the inlet connection, and is applicable to tank mounted compressors up to 15 horsepower or 60 cubic feet per minute. It is equipped with either an electric or mechanical attachment for operating the two-way unloading valve. The switch and gage has a heavy duty gearless movement, slide rule dial, and a horizontal self-draining and nonfreezing bourdon tube.

Strip Abrasive: Minnesota Mining & Mfg. Co., St. Paul, has developed a reinforced spiral wound abrasive strip for finishing holes and other hard-to-reach areas. It is made of abrasive cloth wound spirally around a reinforced center which permits it to be threaded through an oil hole or other opening.

Plier: Knu-Vise Inc., Detroit, is introducing a new plier that provides a self-setting pressure spindle to compen-

(*Concluded on page* 162)



Early in 1942 the W.P.B. in conjunction with the D.P.C. requested that the Ohio Ferro-Alloys Corporation undertake the design, supervision of construction and operation of an efficient ferro-silicon plant. In that same year Wenatchee Alloys, Inc., Wenatchee, Washington, was placed in operation under Ohio Ferro direction, with all production, then and at present, allocated by the War Production Board.

It is interesting to know that Ohio Ferro-Alloys and its subsidiary, Wenatchee Alloys, Inc., fulfilled this vital wartime obligation without a profit fee, and manages the plant without profit participation or other fee. The personnel of Ohio Ferro-Alloys earned signal honors in quickly satisfying a critical need. Their feat reflected Ohio Ferro-Alloys skill and experience in ferro-alloy production.

You'll find the integrity of the Ohio Ferro-Alloys Corporation represented in the consistently high quality of their materials. And you'll appreciate cooperative service by well-informed men.

FERRO-SILICON 50%, 75%, 85%, 90%

FERRO-CHROMIUM • FERRO-MANGANESE

BOROSIL • SIMANAL

BRIQUETS

OFA SILICON, MANGANESE, CHROME

PHILO — DEPENDABILITY · QUALITY · SERVICE

RAINIER — DEPENDABILITY · QUALITY · SERVICE

Ohio Ferro-Alloys Corporation

Canton, Ohio

Chicago Detroit Pittsburgh San Francisco Tacoma

FOR SALE . . .
Better Grinding Wheel Production

From the Cortland Engineer right through the entire organization each member of the outfit is concerned with one thing: not just making good wheels, but . . . *the best possible results for you in grinding wheel production!*

The field engineer studies your work and decides the type of wheel you need . . . the laboratory specifies the abrasive, grain, grade, structure and bond that will do the job best, and most economically . . . and Cortland Quality Control throughout all manufacturing operations makes certain that you get what you want —*in every wheel shipped.*

The result? A growing list of satisfied users . . . faster grinding wheel production . . . higher ratio of stock removal to wheel wear . . . longer life and lower costs.

Why not give this combination a trial in your snagging work?

17

Write CORTLAND GRINDING WHEELS CORP., 6 Cortland Street, Chester, Massachusetts.

For Better Snagging

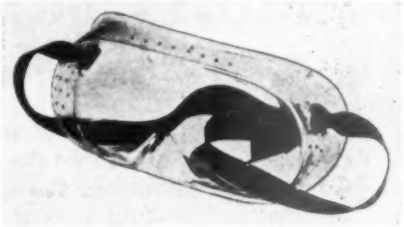
CORTLAND

(*Concluded from page* 160)

sate for variations found in the thicknesses of metal or parts clamped. It was designed originally for use in the aircraft industry to hold metal on wings during riveting. The plier is 8 inches long, weighs 22 ounces. Throat capacity is 0 to ⅜-inch, depth is 2⅝ inches.

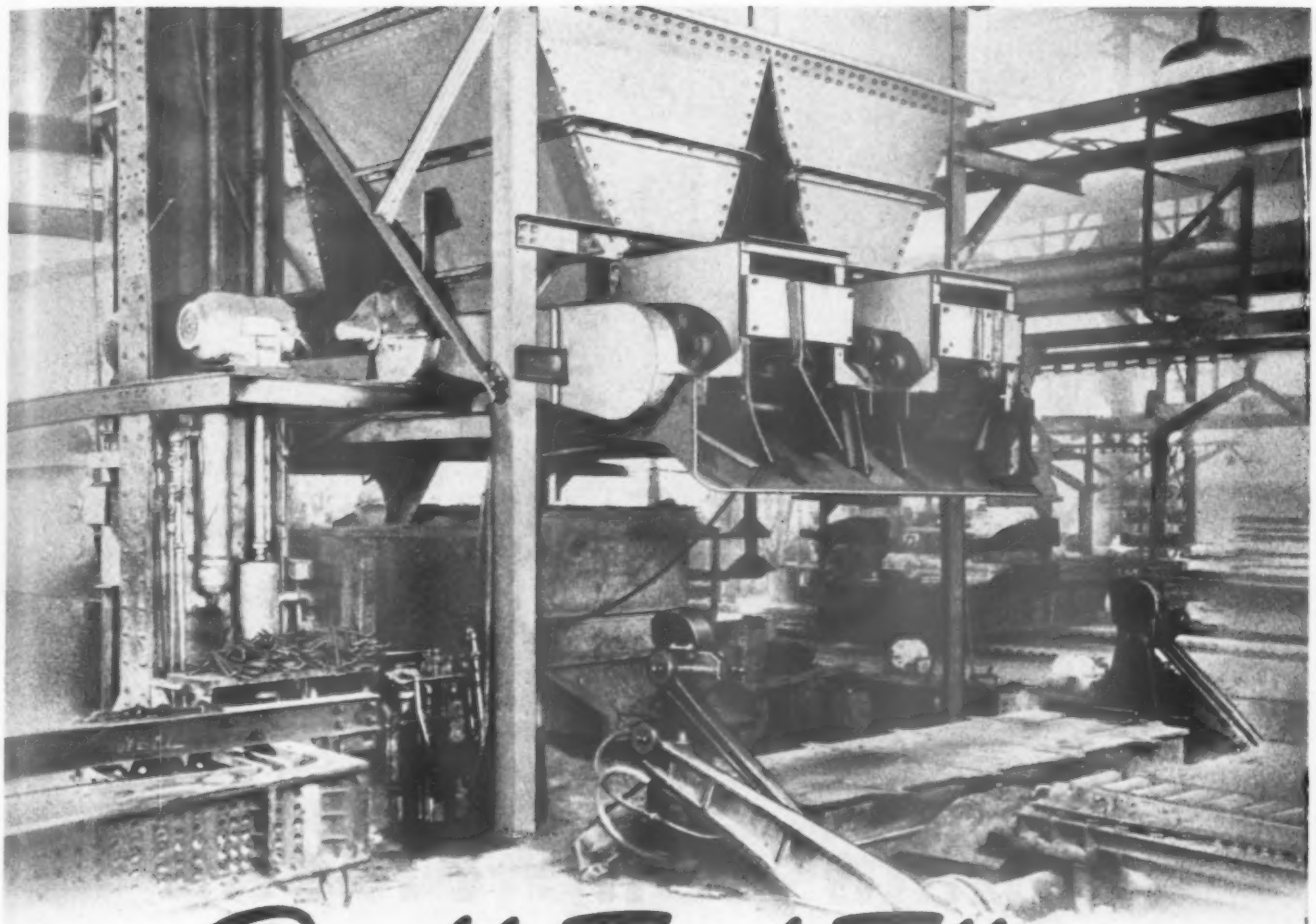
Polishing Lathe: Jones Engineering Co., Ellwood City, Pa., has developed a new polishing lathe for heavy duty. Equipped with two contact rolls and fast cutting abrasive belts, it is designed for bench or stand mounting. It is built for two 14-inch diameter, 3-inch face contact rolls, 1 11/16-inch diameter shaft and 34 inches overall length. Spacing between the inside faces of the wheels is 24 inches, with 9 inches from the base to the center of the shaft. Longer shafts are available. The unit is equipped with a 3-groove V-belt motor drive and is used with a 2, 3 or 5 horsepower motor mounted under the bench or stand where it is protected from dust and dirt.

Goggle: U. S. Safety Service Co., Kansas City 6, Mo., is offering a new goggle of noninflammable plastic. It allows clear vision both to the front and sides and can be worn over glasses. The goggle is ground and polished and made



in both lucite and acetate, the former for better vision and the latter for unusual strength. Weighing only 1½ ounces, the goggle is so constructed that the lens does not touch when laid down.

Die Casting: Lester - Phoenix Inc., 2711 Church Avenue, Cleveland, is offering two new high-speed, high-pressure die casting machines designed specifically for high production of smaller castings. One unit is for aluminum, brass magnesium alloys, the other for zinc, tin and lead alloys, but each is convertible to operation with the other types of metals. The zinc machine, capable of making 400 to 500 shot per hour, employs a submerged plunger and gooseneck injection system at pressures from 1400 pounds per square inch for a 6-pound casting to 2200 pounds for a 4-pound casting. The aluminum machine has a cold chamber injection system, with injection pressures up to 20,000 pounds per square inch available.



Double Flask Fillers
speed the making of large molds

● Bartlett-Snow Flask Fillers are available in a wide variety of types and sizes, including swinging chute flask fillers,—pivoted boom flask fillers,—stationary bin and apron feeder flask fillers,—and special designs to meet unusual conditions.

The stationary bin and apron feeder flask fillers are readily adapted to the floor space, head room, and other conditions of the individual installation, and,—when used in multiples as double and triple flask fillers, are suited especially for use with large, long molds. The equipment may consist of two or three single units mounted together, or a single large hopper, fitted with two or three apron feeders. In either case the apron feeders are provided with deflecting plates or chutes that spread the sand to far corners of the flask.

Our recently issued 40-page Bulletin No. 91, which illustrates many different types of flask fillers, and other Barlett-Snow Foundry Equipment . . . will be of great interest to every foundryman. Send for a copy!

THE C. O. BARTLETT & SNOW CO.

6201 HARVARD AVENUE • CLEVELAND, OHIO

Engineering and Sales Representatives in the Principal Cities

FOUNDRY SAND, MOLD AND CASTINGS HANDLING • • DUST AND FUME CONTROL SYSTEMS • •

Adams Slip Flasks

(Cherry or Aluminum)

—for dependable, low-cost production

Adams Aluminum Slip Flask

Adams Cherry Slip Flasks and Adams Aluminum Slip Flasks are custom-built to your specifications, with any desired length, width or depth.

Trimmings are accurately machined and can be adjusted to compensate for wear. The sand strip mechanism is quick-acting and convenient and it will stand up under the jolting and squeezing of power machines.

Pins to suit your preference — wide-V, double-V, round, double-round or special types, accurately machined on bearing surfaces.

THE ADAMS COMP

MOLDING MACHINES · FLAS

Adams Jackets

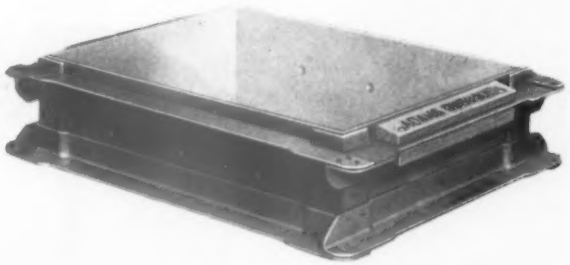
(Cast Iron or Aluminum)

—assure perfect mold protection

The unique patented construction of the Adams Cast Iron or Aluminum Jacket, combining horizontal and vertical corrugations, provides great strength and rigidity with minimum weight.

Inner surfaces are accurately surface ground, and assembly is made on a fixture to exact size and to assure correct taper in the case of tapered jackets.

Specify Adams Jackets for proper mold protection. For best results, use them in combination with Adams Slip Flasks (cherry or aluminum) or Adams Cherry Snap Flasks.



Adams Steel Jacket

Y · DUBUQUE, IOWA · U.S.A.

QUIPMENT · Established 1883

This summary of a full year's operation helps explain the popularity of Detroit Rocking Electric Furnaces

Records of their performance reveal why Detroit Furnaces have steadily increased in popularity. With a Detroit Furnace you can get 8 ferrous or 16 non ferrous heats in one eight-hour day—and with a minimum amount of labor.

You can get precise metallurgical control and thus highest quality results. Versatile, flexible and fast, the Detroit Rocking Electric Furnace has proven itself the most efficient Foundry melting unit for the widest variety of metals and alloys.

SUMMARY OF ONE YEAR'S PERFORMANCE
Of Midwestern Manufacturer of Steam Specialties
Using 4—Type AA—1000 lb. Detroit Electric Furnaces

Metal Melted	9,624,625 lbs.
No. of heats melted	12,049 heats
Electrodes used	17,960 lbs.
3.75 lbs. electrodes per ton of metal.	
Power Used	280 Kw. Hrs. per ton
Net Metal Loss	0.5%
Overall Plant yearly shrinkage of metal	1.40%
Charges consisted of:	
Total Remelt	32%
Gates	5%
Scrap	18%
Borings	
	55%
Ingot—made in 2000 lb. Detroit Furnace from	
Furnace charges of grindings, concentrates, turnings and scrap	27%
Purchased new metals	18%
TOTAL	100%

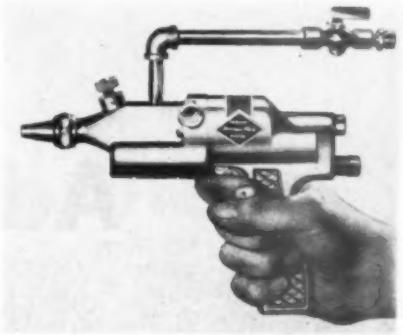
There is a correct size Detroit Furnace to meet all requirements from the 10 lb. laboratory size up to 8,000 lbs. molten metal capacity.

DETROIT ELECTRIC FURNACE DIVISION
KUHLMAN ELECTRIC COMPANY • BAY CITY, MICHIGAN

New Tool Salvages, Repairs Castings

A new development in the field for salvaging and repairing gray iron, malleable, steel and nonferrous castings combines the arc-welding and metal-spraying processes. Equipment designed by the Metallizing Co. of America, Chicago, includes an arc-welding transformer operating on 110, 220, 440 or 550-volt, 60-cycle, single-phase alternating current, and a pistol or gun operating on approximately 6 cubic feet of air at 40 pounds per square inch pressure.

The pistol contains feed rolls and a trigger arrangement for manual feeding of the rod as well as a vibratory device. Compressed air, in addition to operating feed rolls, is said to cool the electrode as well as the work. In operation the surface of the work is touched with the electrode of suitable material which then becomes plastic. The vibrator automatically pulls the electrode away, and the compressed air breaks it down similar to

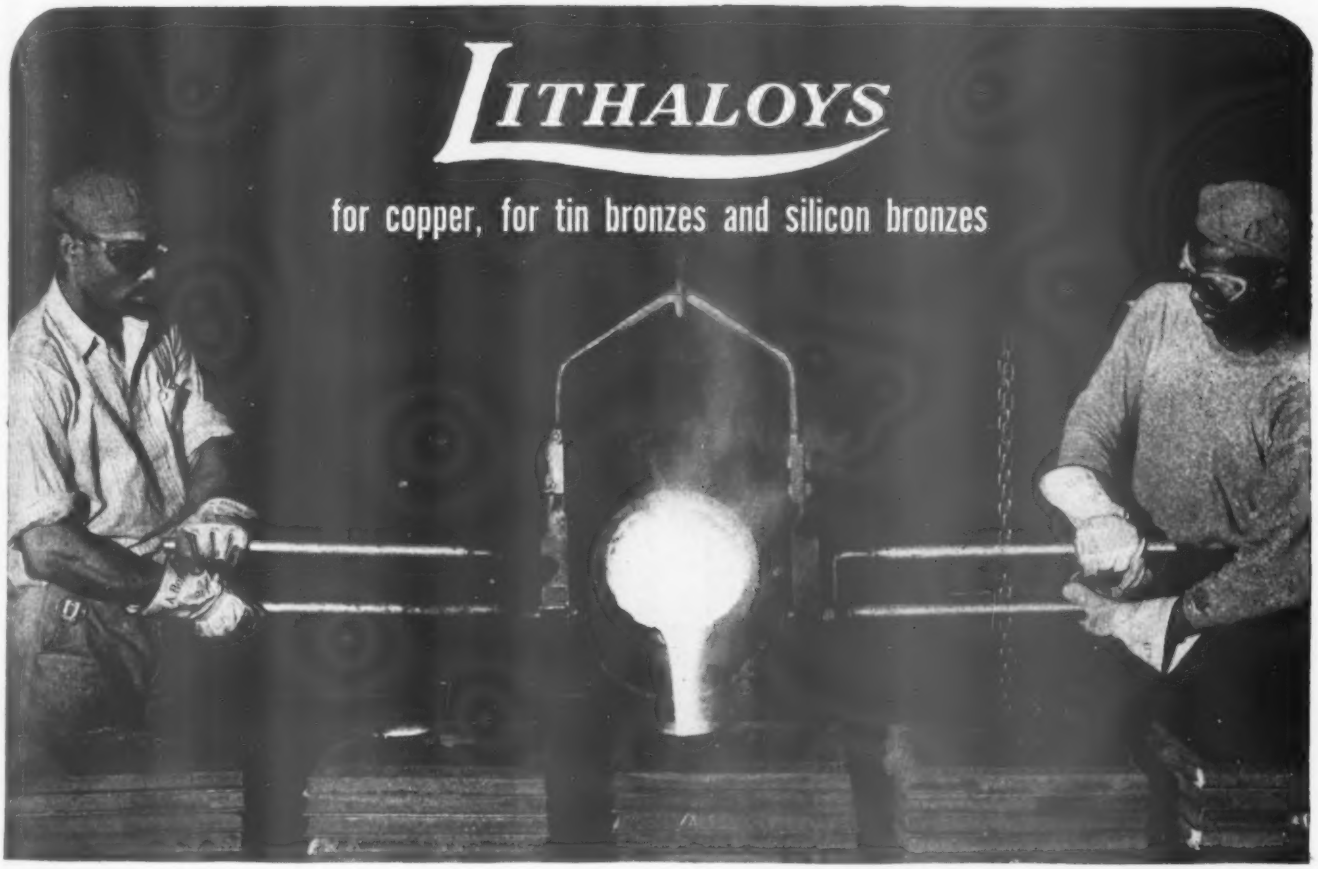


metallizing. Recoil of the vibrator is claimed to pound or forge the electrode metal into the casting structure as it is being built up.

Use of the equipment is said to result in dense deposits of weld metal without apparent line of demarcation from the work and with no chance of heat causing stress or distortion. In a midwestern plant some defective aluminum alloy castings were salvaged by the process using aluminum rod, and after machining, it is claimed there was no observable difference between welded and parent metal. During the operation temperature of the casting or area being treated did not rise above 125 degrees Fahr. After machining the parts were anodized without any trouble.

A foundry operating at only 75 per cent capacity due to erosion of core boxes and to the long time for repair, found relief from the latter through use of the welding process. Core boxes were used in a coreblowing machine, and the sand gradually cut away certain areas which had to be rebuilt. A crew of patternmakers reworked those areas with steel and brass taking approximately 6 hours for each. Through use of the welding process 5 core boxes with an average of 3 areas to be repaired were refinished and ready for service in 4½ hours. Time

(*Concluded on page* 168)



Better Castings . . . Increased Output *with* Same Equipment . . . Same Crew

. . . are being obtained by foundrymen who are using the metal Lithium for ladle treatment . . . because Lithium metal degasifies and deoxidizes thoroughly, eliminates porosity and gas cavities, scavenges slag and oxides, improves fluidity and thus often permits lowering pouring temperatures.

And the use of Lithium does not upset your normal foundry procedure. A small amount of Lithium, compounded with the same metal as your casting, is added to the melt a *few* minutes before pouring—that is all.

Lithium does its job by combining with hydrogen, nitrogen, oxides, sulphides and other non-metallic impurities. The compounds so formed are of non-metallic nature and have low specific gravity. They are insoluble in the metal and flux out quickly. Thus your castings are improved by Lithium but do not retain any appreciable quantity of it.

* * *

Write LITHALOYS CORPORATION, recognized authority on Lithium, for information.

LITHALOYS CORPORATION

444 MADISON AVENUE, NEW YORK 22, N. Y.

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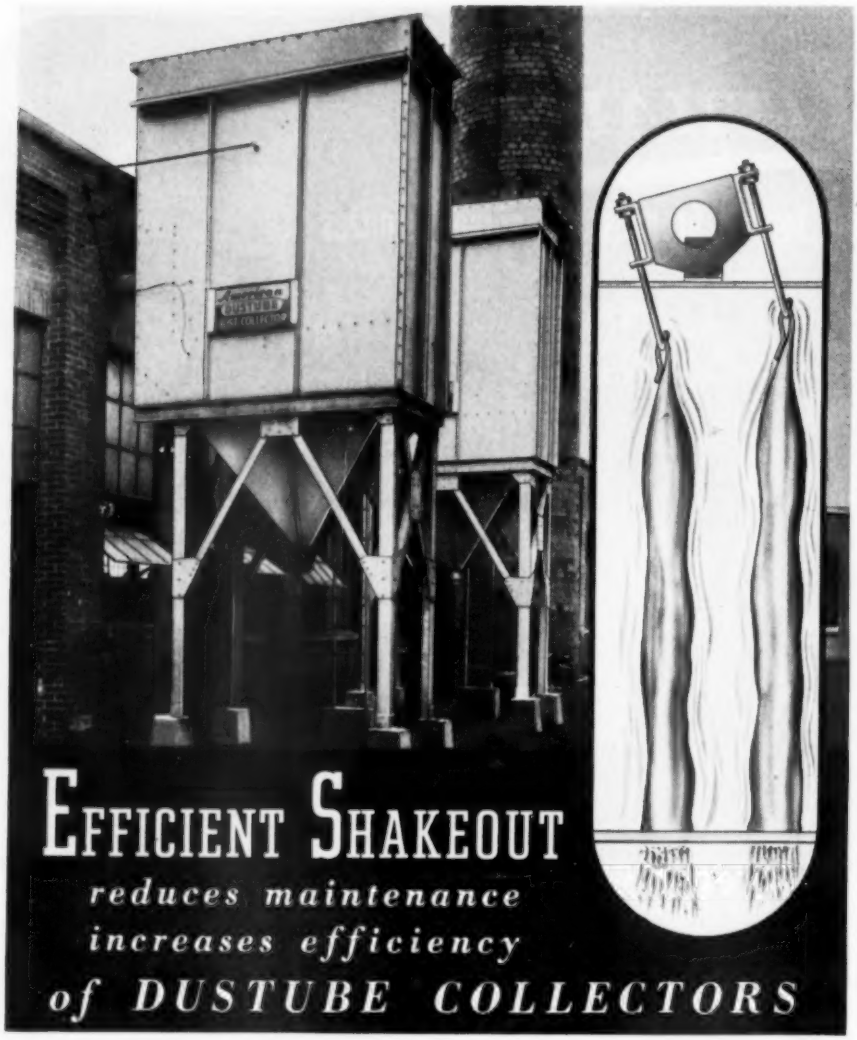

EFFICIENT SHAKEOUT

reduces maintenance
increases efficiency
of DUSTUBE COLLECTORS

EQUALLY as important as the initial investment required for dust collecting equipment is its efficiency and cost of operation. One criterion here is the method of shakeout employed in periodically freeing the filter tubes of the dust they have collected. Improper shakeout is one of the prime causes of wasted horsepower, excessive tube replacement, and excessive back pressure which allows the dust to settle back in the pipes of the entire system.

* *The diagram demonstrates Dustubes efficient method of shakeout. When tubes are shaken the dust falls directly into the hopper. It is not deposited on other filters underneath. Sifting dust from one tier of filters downward to another multiplies shaking, increases cloth wear and power costs. You can eliminate these problems with a DUSTUBE.*

In Dustube collectors the filter is limp and deflated and completely subject to the shaking action. Any dust cake is effectively broken up and deposited directly into the hopper below. The Dustube filter is never shaken under tension which might enlarge the pores of the cloth. It is not stretched over a wire cage or form which might tear it or cause increased wear. With a Dustube shakeout periods are shorter and less frequent . . . horsepower is saved . . . filter tube wear decreased. Because the filter is thoroughly cleaned the danger of back pressure is eliminated. Dustube will efficiently handle your dust problem. Write for more information today!

American Foundry Equipment Co., 505 S. Byrkit Street
Mishawaka, Indiana.

ARMY E NAVY

AMERICAN dustube dust collectors

(*Concluded from page* 166)

study indicated that by the old method 9½ days would have been required for repair. At the same foundry, fillets on patterns were repaired by the process in a few minutes.

A patternmaker in Chicago found that a boss had been placed in the wrong location on an aluminum pattern. Under old practice the boss would have to be drilled out, and a plug made to fill the resulting hole. Then a new boss would have to be made and attached in the proper place. However, by use of the new welding procedure, the hole was plugged with weld metal, and a new boss built up in the correct position at a considerable saving in time and labor.

The welding process can be employed on steel, gray iron, malleable and bronze castings. For the first three, nickel welding rod is used and a slight difference in color will be noticed between the weld and parent metals. Similarly, in the case of bronze castings where a low-zinc bronze rod is employed, a slight discoloration will appear. With aluminum alloys, weld and parent metal are the same color.

Book Review

Oxy-Acetylene Handbook; 587 pages, published by the Linde Air Products Co., Unit of Union Carbide & Carbon Corp., New York. Price $1.50.

This new manual will serve as a guide for self instruction or as a class room text book in vocational and trade schools, technical high schools and engineering colleges. It covers the entire range of the oxyacetylene process with clear instruction for handling all the common commercial metals, simple explanation of the fundamental principles of the various methods of depositing and controlling molten metal, also the operating principles of the equipment and instructions for care and maintenance.

A few of the many subjects covered in this how-to-do-it book include: How to set up, operate and care for the apparatus; flame adjustment; how to identify metals; how to weld steel, gray iron, malleable iron, galvanized iron, aluminum, copper, brass, bronze, nickel, monel, lead, magnesium; how to bronze weld; how to do heating, bronze surfacing, hard facing, flame hardening, silver brazing; how to cut steel, cast iron, stainless steel; how to test welds; how to develop welding procedure controls, and how to organize and lay out a welding shop. A comprehensive index, adequate use of sub titles and extensive data section make this book useful for shop reference purposes.

Fewer Heat Treating Furnaces Shipped

Shipments of heat treating furnaces the first 5 months this year totaled $22,698,000, off about 63 per cent from the corresponding 1943 period, according to WPB. Backlogs of $23,405,000 at the end of May were 52 per cent smaller than a year ago.

DoALL Zephyr!

FRIEND *in* NEED

This wide-throat DoALL Zephyr is a new kind of band saw. It has been especially designed to handle quicker and smoother all non-ferrous metals and alloys and the new plastics and laminates that are so necessary in war work today and will go into new products when peace comes.

A godsend to forward-looking manufacturers who want to use the new materials, but are stumped in cutting and shaping them because of unusual hardness, sponginess, brittleness, etc.

- ★ Magnesium
- ★ Aluminum
- ★ Non Ferrous Metals
- ★ Plastics
- ★ Laminates
- ★ Lumber and Plywoods
- ★ For Friction Cutting

The Zephyr does straight line, contour or bevel cutting. Accommodates extra large castings, forgings and bars.

36" throat
Work thickness capacity, 20"
Variable speed from 1500 to 10,000 f.p.m.
4-way tilting table 30" square with 17 x 20" extension
Solid aluminum wheels, equipped with hydraulic brakes
Motor—10 H. P.
Occupies 48 x 60" floor space.

Write today for illustrated folder about the remarkable performance of the speedy Zephyr

DoALL

INDUSTRY'S NEW SET OF TOOLS

CONTINENTAL MACHINES, INC.
1352 S. Washington Ave. • Minneapolis 4, Minn.

Sales & Service Offices: Baltimore, Boston, Chicago, Cleveland, Denver, Detroit, Erie, Houston, Indianapolis, Los Angeles, Milwaukee, Minneapolis, New Orleans, New York, Orlando, Philadelphia, Pittsburgh, Rochester, Rockford, St. Louis, San Francisco, Seattle, Toledo, Tulsa, West Hartford.

★ ★ ★ SINCE 1911 ★ ★ ★

DEPENDABLE **CORE BLOWING** EQUIPMENT

NEW HEAVY-DUTY BLOWER

FOR MOTOR CASTINGS WORK...

Strictly for BIG Cores and Fast Production
Takes Core Box up to 18" x 24"

Designed as a special blower for a leading producer of airplane motor castings, this unit is now offered as a standard Demmler blower. Features include an accurate hydraulic core box draw, table equipped with Timken rollers, 12" diameter throat opening, control mechanism totally enclosed. The height of the frame may be adapted to varying sizes of core boxes.

Reports on this new machine from users indicate that it has unusual possibilities in production of aircraft, tank and truck motor castings. At the present time we can make good deliveries, and invite your inquiries.

WM. DEMMLER & BROS. · KEWANEE, ILLINOIS

CORE BLOWERS *Exclusively*

Adjusting Wages In The Foundry

(*Continued from page* 105)

ers with a view to correcting inequitable earnings resulting from the present system.

The Board also approved an increase of 5 cents an hour for certain classifications of non-production workers in the same plant. These classifications included carpenter, electrician, pipefitter, tool grinder, tool forge and welder, and several others.

Premium pay for night shifts may also be approved by the board. These are made on the basis of three considerations —area practice, industry practice, and intra-plant relationships. The board granted such pay shift premiums in its decision approving a differential of 5 cents for the second and 7 cents for the third shifts respectively for the Milwaukee plant of the Globe Steel Co.

The board may also approve vacations which provide one week's paid vacation after a year of service and two weeks after 5 years of service. Such a vacation plan was approved on Jan. 26, 1944, for the Fulton Iron Works Co., St. Louis. Sick leave plans may be approved by the board.

May Use Incentive Plan

The board may approve incentive plans submitted on voluntary application, and concurred in by the bargaining agent, if there is one for the workers. The evaluation of these wage incentive plans by the board will be limited to a determination of whether or not it would result in unauthorized wage rate increases, or an increase in the general level of production costs.

New plans, the extension of an existing plan to a new department, or a major revision of an existing plan require board approval.

Employers may also grant increases to their employes without board approval, under certain other circumstances. For instance, if an employe is promoted to a job with greater responsibility, he may receive an increase up to the minimum of the range for the job, or 15 per cent above what he was being paid, whichever is higher. Increases may also be granted for merit, seniority, or length of service. These increases may be granted without board approval under the provisions of the promotions schedule where records show that such a wage schedule was in existence before July 1, 1943.

Establishments employing eight or less employes may grant increases without the approval of the War Labor Board, except in specified industries.

Increases for employes receiving less than 40 cents an hour may be given without board approval, as well as increases to equalize the pay for women doing work of the same quality and quantity as that done by men in the

(*Concluded on page* 174)

CAN YOUR OVEN EQUAL this one

IN CLOSE CONTROL OF TEMPERATURE

COLUMBIAN STEEL TANK COMPANY

ESTABLISHED 1893

TRUCK TANKS, SEMI-TRAILER TANKS, OIL STATION AND OIL FIELD TANKS, UNDERGROUND TANKS, BARRELS, BUCKETS, FUNNELS, DRIPPING CANS, CONCRETE MIXING CANS, READY-FORMED METAL BUILDINGS, PLATES, SHEETS, ANGLES, ETC.

GRAIN BINS AND TANKS FOR THE FARM, GRAIN ELEVATOR BINS, INDUSTRIAL STORAGE TANKS, STEAM CONDENSERS, CORRUGATED STEEL CULVERTS, TRUCK HOISTS, TRUCK BODIES, COMMERCIAL STEEL SPECIALTIES, SHEET STEEL SPECIALTIES

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KANSAS CITY, MO.

May 12, 1944

The Lanly Company
750 Prospect Avenue
Cleveland, Ohio

Gentlemen:

Enclosed you will find two (2) prints with negatives of the installation of the paint baking oven you recently designed and built for us.

We are delighted with the operation of this oven and find that it holds an evenly distributed heat throughout the unit. Before we started production with the oven, we tested with thermocouples, taking readings at nine different points in each stall, or a total of twenty-seven readings for the oven. After a slight adjustment of the duct openings, we found that the oven had a 40F. variation in temperature and another 40F. variation due to the off and on type of motor valve on the burner, giving a total variation throughout the entire oven of approximately 80F. These tests were made at a temperature setting of 300°F. The highest temperature we have operated the oven is 475°F., but feel it had not reached the maximum then.

Again we wish to say we are well pleased with this installation.

Very truly yours,
COLUMBIAN STEEL TANK COMPANY
D. DeBrunner, Engineer

DD:js
Encl.

ONLY 8° F. VARIATION IN THIS—A STANDARD LANLY OVEN.

You can rely upon getting high efficiency from any type oven or furnace. Write for catalog.

THE LANLY CO.

OVENS FOR INDUSTRY

HEATED BY GAS, OIL, ELECTRICITY OR STEAM

750 PROSPECT AVENUE • CLEVELAND, OHIO

Bondite

Note peeling action in facing.

25 ton ingot molds—note that chipping and grinding has been eliminated.

core and facing binder

SOLVES ANOTHER PROBLEM

KAISER COMPANY, INC.

Iron and Steel Division, Fontana, California

According to Mr. Coulson, foundry superintendent, "The saving in man hours alone since using Bondite has eliminated a serious bottle neck at the Kaiser plant.

"On the large ingot molds, shown on the opposite page, cleaning time has been cut 50 per cent!

"And an appreciable saving has been effected in materials used.

"Bondite works well in old sand for on ignition it produces a carbon dioxide volatile that covers surface grains, giving them a protective coating against metal action, thus permitting the sand to peel away from the casting.

"We wouldn't be without Bondite at Kaiser's today!"

The above is but one of many result stories from foundries using a simple mix of Bondite and Bentonite. Bondite's foundry fitness is being proven in foundries everywhere — its superiority can be readily established — easily proven.

Developed to meet individual foundry conditions, Bondite is a superior, dry type core and facing binder of hydrocarbon base — it's lighter in weight — cuts drying time 24% over oils — and cuts binder and sand costs.

Bondite eliminates oven drying — for Bondite skins dry easily and will withstand greater torch heat without crumbling edges — Bondite does away with nailing — stops scabbing — lets metal flow smoothly. It makes a superior chill wash.

Bondite will help you produce cleaner, smoother castings, reduce scrap and increase production in steel, iron and brass. Write, wire or phone NOW for full information.

R. C. (BOB) COULSON
Foundry Superintendent

BONDITE

Produces cleaner, smoother castings.
Cuts waste, lowers costs.
Reduces cleaning time, eliminates oven drying.
Increases production in steel, iron, brass.
Works successfully in old sand.
Saves binder and new sand costs.
Eliminates nailing, stops scabbing.

Bondite Corporation

25 EAST 38TH ST., LOS ANGELES 11, CALIF., L. A. PHONE: JEFFERSON 3178 — 844 150TH ST., HAMMOND, IND., HAMMOND PHONE: 2070

Melting
NON-FERROUS METALS
the efficient way
. . . safely

with . . .
HAUSFELD
FURNACES
Built for Service
FURNACES FOR
BRASS • ALUMINUM • MAGNESIUM
AND ALL OTHER
NON-FERROUS ALLOYS
The Campbell-Hausfeld Co.
300-320 MOORE ST. HARRISON, OHIO

(*Concluded from page* 170)

same plant. Customary bonuses or bonus payment made by an employer to an employe entering the armed forces do not require board approval.

An employer may pay insurance premiums for the benefit of his employes without seeking the approval of the board, if the amount does not exceed 5 per cent of the employes' annual wage. However, it should be noted that such insurance policies may not be cashed in.

Certain increases fall under other than War Labor Board control. All salaries over $5000 a year and salaries less than $5000 a year of supervisory or professional employes not represented by labor unions, are under the jurisdiction of the Bureau of Internal Revenue.

Other increases not under the jurisdiction of the board are:

1. To Meet Requirements of Federal or State Laws.
2. Federal, State, County, and Municipal Employes.
3. Non Profit Organizations.
4. Employes Subject to the Railway Labor Act.
5. Farm Workers.

The National War Labor Board feels that the complexities of wages and hours and other labor-management relationships can best be settled by the parties themselves. Disputes which lead to substantial interference with the war effort come to the board when they cannot be settled by collective bargaining or conciliation.

To aid in a quick victory over our enemies, the War Labor Board's responsibility is to stabilize wages, prevent inflation and settle disputes that would cause work stoppages in the nation's vital war plants.

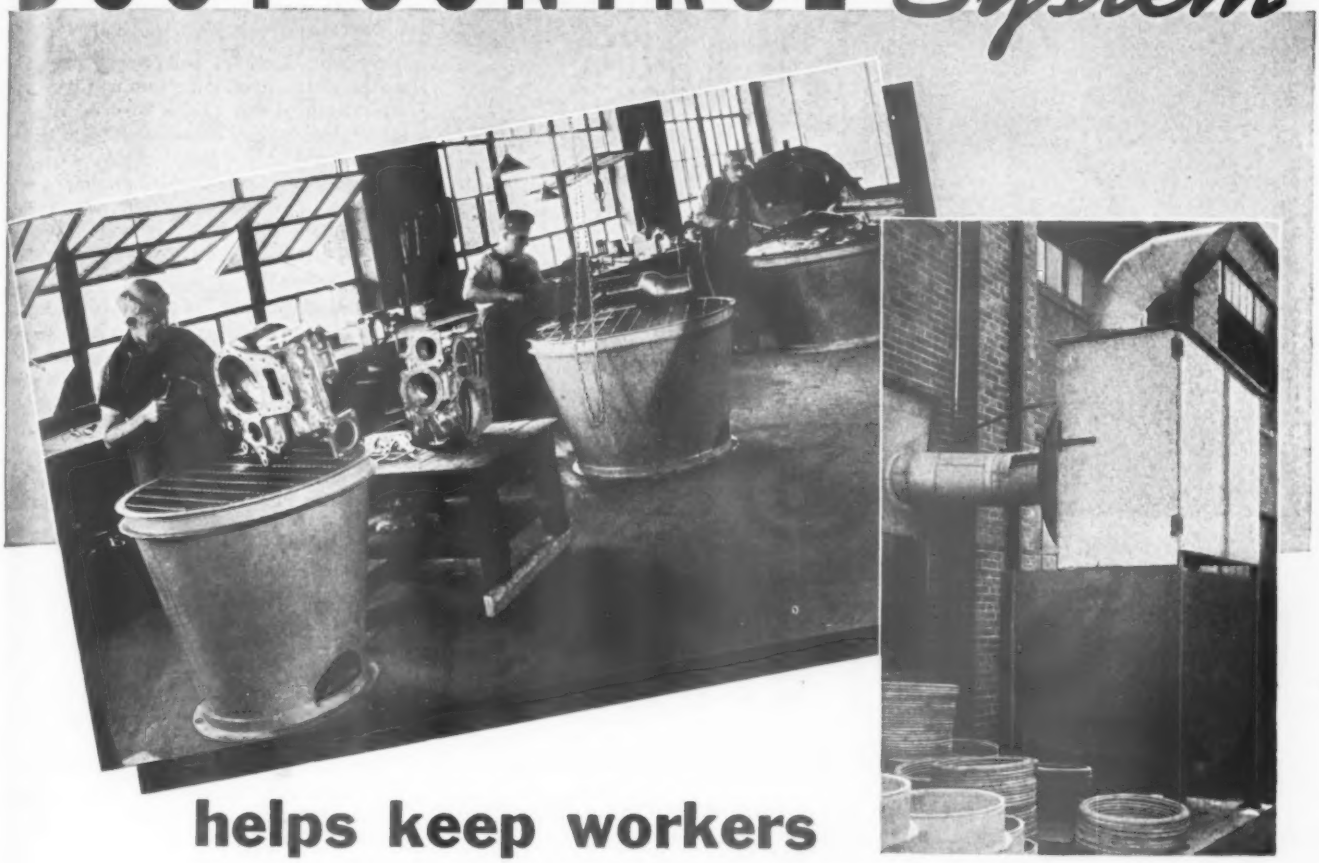
Sets Up Divisional Sales Offices

National Carbon Co. Inc. under a new sales setup is establishing seven divisional offices, four of which now are in operation. A new Atlanta, Ga., division office, covering sales in the Southeast, has J. F. Warnell as manager, with C. J. Chapman assistant manager and W. R. Peppard office supervisor. C. C. Joslyn is manager of the new Dallas, Tex., division, J. L. Mullen is assistant manager, and J. F. Uhl office supervisor. A. C. Bryan is division manager at Kansas City, Mo., with E. L. Dibble assistant manager and C. H. Wade supervisor. San Francisco is headed by R. P. Tolles, with A. R. Miller and O. B. Randahl assistant managers. Other offices will be located at Chicago, Pittsburgh and New York.

Equipment Builders Set Meeting Date

Foundry Equipment Manufacturers Association will hold its annual meeting at the Homestead Hotel, Hot Springs, Va., Oct. 13-14.

KIRK & BLUM *down-draft*
DUST CONTROL *System*



helps keep workers on the job at FIRE ENGINE plant

At the Seagrave Corp., Columbus, Ohio, this Dust Control System, comprising two four foot diameter tables and one three foot diameter table (as shown in above illustration) keeps dust below breathing level of workers.

Tables are located to give ample working space between stations. Air enters from the rear of workers and is drawn over their shoulders downward through gratings on tables into under-the-floor ducts where it is exhausted outside of building by a Rotoclone handling 6400 cubic feet of air per minute. This unit is of such capacity to handle additional air when found necessary.

This installation was designed to take into consideration the individual requirements, such as limited floor space and to utilize the monorail located directly above the 3 down draft tables, handling the parts of engines to be machined, much of which grinding is done by hand.

Kirk & Blum Engineering Staff makes a thorough analysis of your special dust or fume control problem, and makes recommendations based on more than 37 years of specialized experience. For details write

The **KIRK & BLUM** *Manufacturing Co.*
2808 SPRING GROVE AVE. CINCINNATI 25, OHIO

WRITE for these BOOKLETS:

"DUST COLLECTING SYSTEMS IN METAL INDUSTRIES"
"BLOWER SYSTEMS FOR WOODWORKING PLANTS"
"FAN SYSTEMS FOR VARIOUS INDUSTRIES"
"INDUSTRIAL OVENS"
"COOLING SYSTEMS FOR THE GLASS INDUSTRY"
"DATA ON KIRK & BLUM PRODUCTION FACILITIES"

KIRK AND BLUM

VULCAN Furnaces

For Fast, Accurate Heating and Heat Treating Operations

The battery of three Car Hearth Furnaces illustrated above is typical of all VULCAN installations in advanced design, efficient, high-speed heat treatment, and economical operation and maintenance. Used for handling miscellaneous forgings and weldments, they are oil fired, with complete automatic control in two zones. Temperature uniformity of 10° plus or minus is readily maintained. Cars and doors are motor operated. Doors are equipped with air operated clamps for sealing.

Furnace No. 1, in foreground, is direct fired and used for annealing and normalizing at maximum temperature of 1700°.

Furnaces No. 2 and No. 3 are convection heated and are used for normalizing at temperatures up to 1250°. Each is equipped with two high temperature fans.

An imposing list of installations demonstrates the important part allotted to VULCAN Furnaces in the Nations' war effort, and of the high measure of success attending it.

Although each VULCAN installation is engineered to meet specific requirements, the cost is generally no greater than for standardized equipment. Let us quote on your requirements.

VULCAN CORPORATION
1797 CHERRY STREET, PHILADELPHIA, PA.

QUENCHING LARGE STEEL CASTINGS

(*Continued from page* 77)

After the casting has been properly soaked at the quenching temperature, the skid is pulled out of the furnace onto a suspended roller conveyor which then is lowered into the water. Water-cooled pipes, previously coated with graphite, and the lower portion of the skid remain comparatively cool. Upper portion of the skid attains the quenching temperature.

Quenching end of the furnace is shown at *A*. The cable from the winch projecting under the furnace door is shown at A. The cable from the winch *B* is used to pull the skid onto the roller conveyor. Fig. 9 provides a view of the quenching tank, the block and tackle at one end of the quenching rack *A*, the quenching rack *B* and the control house *C*.

An electric timing device similar to that mentioned previously is also employed on this unit. Weight and size of the castings quenched with this equipment are too great to handle automatically, and in this case the clock is connected to warning lights which indicate the end of the quenching operation.

With this equipment, approximately 45 seconds is required to remove the casting from the furnace and immerse it in water.

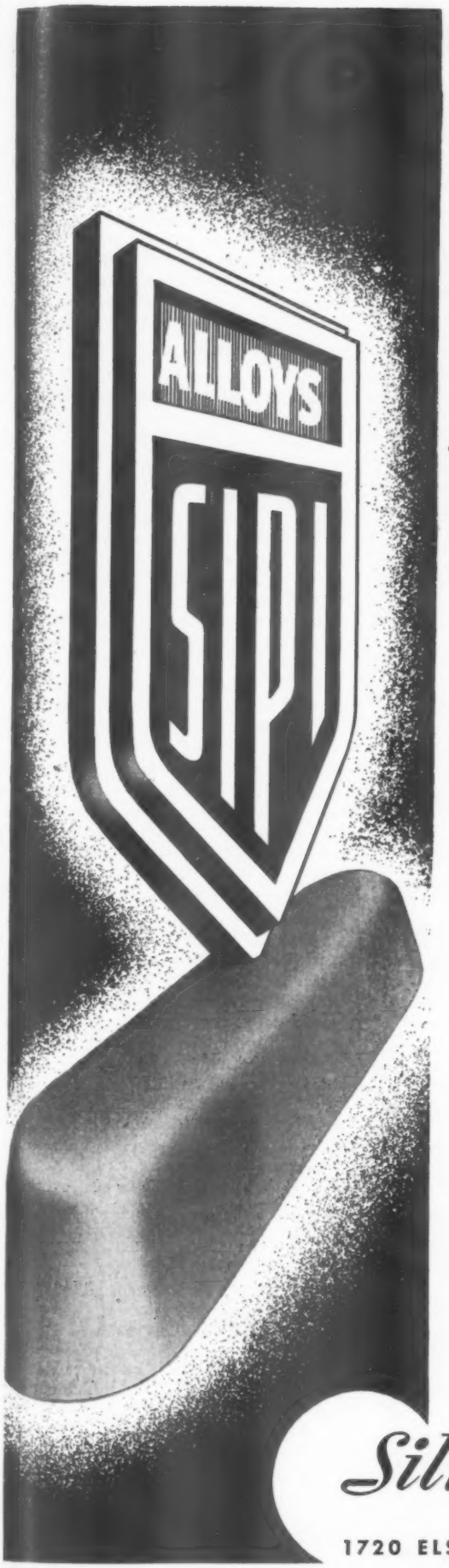
Castings Attain Equilibrium

Initial temperature of the water is again 100 degrees Fahr. plus 5 degrees. No attempt is made to maintain this temperature. Capacity of the quenching tank and overflow tank is 66,000 gallons which is recirculated at the rate of 6000 gallons per minute. With this amount of water and rate of circulation, the temperature rise obtained with the 85,000-pound casting is approximately 20 degrees Fahr.

The furnace employed for the heating operation is lined with a low heat-content brick. During the quenching operation, both ends of the furnace are opened and the furnace permitted to cool. After the quenching operation, the casting again is pulled into the furnace. (The cable again is attached to the front of the skid, but is passed over a sheave wheel at the front of the furnace.) Both doors of the furnace are then closed and the furnace and casting are permitted to attain equilibrium. Temperatures of the casting and furnace will reach equilibrium at 600 to 800 degrees Fahr., depending upon the length of time of the quenching operation. The temperature is then slowly raised to the proper tempering temperature.

In all of these quenching operations, the length of time the casting is im-

(*Concluded on page* 178)

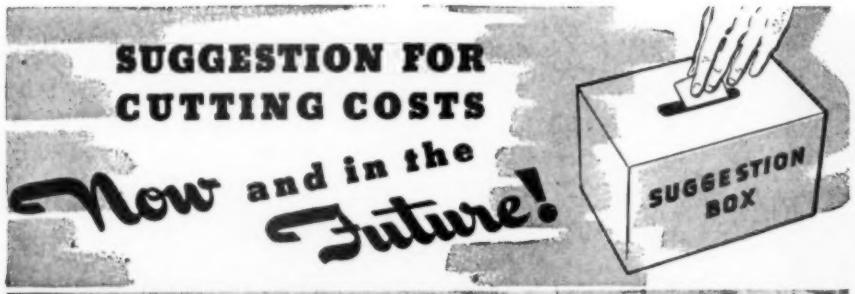


...a symbol of *Quality* in Bronze Ingots

We produce but one grade . . . the best. This high standard of quality rarely varies—and then only when the diligent research and skill of our plant and laboratory technicians suggest ways to improve it. SIPI Alloys are made under the closest metallurgical control . . . from the selection of raw materials through the final process . . . to safeguard against the slightest variance in uniformity. Regardless of how rigid or exacting your specifications may be, specify SIPI Alloys as a guarantee of dependable quality.

Silverstein and Pinsof
INCORPORATED
1720 ELSTON AVENUE CHICAGO 22, ILLINOIS

BRASS • BRONZE • ALUMINUM • LEAD • TIN • SOLDER • TYPE METALS • BABBITT • ZINC BASE ALLOYS



Look Into Everything ROLLER CONVEYORS Can Do . . . Ask STANDARD CONVEYOR

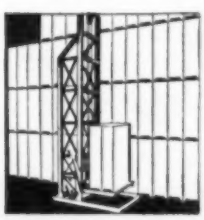
THE steps you take now — the investment in equipment that you may make to cut handling costs will not only pay dividends immediately but can be expected to yield equal or even greater returns in postwar days to come, when handling and other unproductive costs will be under the closest scrutiny.

For example, roller conveyors installed now will be useful in many ways no matter what you may be making or handling when peacetime is here. Roller conveyors are unequalled in low first cost, flexibility and minimum operating expense. They handle a wide range of commodities —parts, packages, units, cartons, cans, bottles, barrels, bundles, drums, boxes. They are available in light, average, or heavy-duty types for either portable or stationary use — in a wide variety of sizes, styles and lengths. Roller conveyors are built in their entirety by Standard, including the vital bearings which are manufactured to the highest standards.

Besides roller, Standard builds belt, chain, slat, and push-bar conveyors, also spiral chutes, tiering and lifting machines, portable pilers, and pneumatic tube systems.

On any conveyor requirement Standard Conveyor is equipped by experience and facilities to recommend and furnish the right type of equipment.

STANDARD CONVEYOR CO.
General Offices: North St. Paul, Minn.
Sales and Service in Principal Cities


TIERING AND LIFTING MACHINES

PORTABLE PILERS

SPIRAL CHUTES

PNEUMATIC TUBE SYSTEMS

(*Concluded from page* 176)

mersed in water is determined experimentally. All of the castings are immersed for a length of time sufficient to decrease the temperature of the heaviest section to less than 500 degrees Fahr. The time is adjusted so that the temperature of the heaviest section is as low as possible without bringing the temperature of the thinnest section below 300 degrees Fahr. thus reducing cracking to a minimum. Once the proper quenching time has been determined for a particular casting, each casting of that design will be treated in the same manner.

Gas Developed in Molds

(*Concluded from page* 86)

meability plus low back pressure. It might be argued that high back pressure would cause the gases to pass from the mold more quickly. It also is true that an equal and dangerous force would be exerted on the molten metal. Blows would be avoided only if the metal pressure was greater than the mold gas pressure.

Table VI is self explanatory. A modest amount of gas is vented through fairly high permeability. In Table VII we note the increased amount of gas produced by the auxiliary binders added with accompanying decrease in hot permeability. Table VIII indicates relatively the same amount of gas with considerable differences in back pressure and hot permeability.

Table IX shows that the hot permeability of the steel sands is not in relation to the cold permeability. The malleable and gray iron sands evolve much gas, have high back pressure and zero hot permeability. This would suggest a dangerous condition, but, in fact, the sands are better than average in other respects and are used regularly to produce very good castings with low scrap loss. This suggests that more test work must be done to determine the danger point and that some new method of testing may be necessary. Table X shows the great difference between synthetic and natural sands in amount of gas evolved and in hot permeability.

Film Depicts Flow Of Metal

Meehanite Research Institute of America Inc., Pershing Square building, New Rochelle, N. Y., has available for use by interested societies or groups a motion picture entitled "The Flow of Metal into Molds." The film, in color, shows the action of molten metal as it is poured into molds of various sizes, shapes and complexities. Prints will be loaned upon request. The film consists of two reels and is for 16 mm. projection without sound.

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TILTING FURNACE

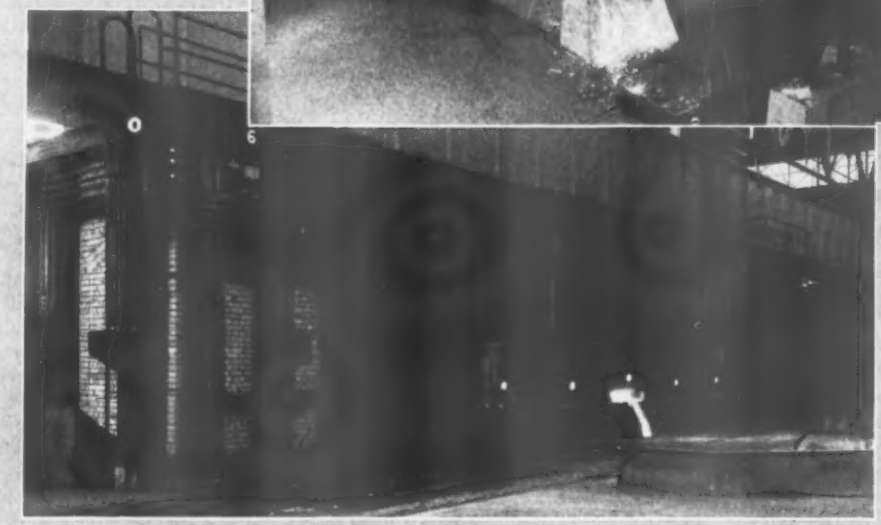
Sound Design—Rugged Construction—Superior Performance

Roof Temperature Control

Furnace Pressure Control

Checker Temperature Control

Slagging the Furnace



Combination Firing Oil or Coke Oven Gas

Emptying before charging a new heat

185 Ton Tilting Open Hearth Furnace

POSITIVE EQUALIZATION OF DUAL TILTING MECHANISM—Equal power on either side of dual mechanism gives uniform action to the tilting portion of this Loftus furnace.—Prevents twist and assures clock-like performance.

FURNACE DESIGN PERMITS RECONVERSION TO STATIONARY FURNACE—This tilter has the unusual feature of being so designed that it can be converted to a conventional stationary furnace at a nominal cost in a minimum of time.

ALL WELDED DESIGN AT KEY POINTS—Rocker Arms, Rocker Supports, Water cooled Port Chills and Chill Supports, Water cooled Doors and Frames, Reversing Valves and Dampers of modern electric welded construction.

OLIVER BUILDING **LOFTUS ENGINEERING** *corporation* PITTSBURGH, PA.

Designers and Builders Engineers, Consultants, Contractors

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Users of "Falls Brand" alloys take the above statement for granted. They have learned that Niagara Falls Smelting & Refining can always deliver no matter how urgent their needs for a specific alloy may be. An indication of the completeness of our stocks is the fact that we have on hand over three hundred different types of alloys.

Niagara Falls Smelting & Refining Corporation is America's largest producer of quality alloys with a production capacity of over 70 million pounds per year. Up-to-date production facilities plus a big, modern laboratory assure you of dependable alloys in any quantity you desire.

The wealth of alloy knowledge that we have in our files is always at your disposal. We welcome the opportunity to offer it to you in hopes that it may prove valuable in solving your present or peace time alloy problems. Write us today — or better still — call us.

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America's Largest Producers of Alloys

BUFFALO 17, NEW YORK

RAPID ROUTINE METHODS FOR SLAG ANALYSIS

(*Concluded from page 87*)

Burn in platinum crucible or alundum crucible and weigh.

NOTE: Heat slag and water. Then add hydrochloric acid (conc) and heat until dissolved. Add 15 milliliters perchloric acid and stir occasionally at first.

Determination of FeO and approximate determination of SiO_2 in slag: Weigh 0.5000-gram sample of the finely powdered slag. Transfer to a *dry* 300 milliliter erlenmeyer flask, add 5 grams of anhydrous sodium carbonate, and mix well. Now add 30 milliliters of 1-1 sulphuric acid. Boil until the silica is almost a jell but not to the complete expulsion of water, cool, add 100 milliliters cold water and titrate with standard potassium permanganate. After titration, add 15 milliliters of hydrochloric acid and heat. Filter with suction and wash silica twice with hot 1-1 hydrochloric acid, then hot water, ignite and weigh.

NOTES: (1) This method gives 1-2 per cent lower silica than the perchlorate method. (2) When titrating with potassium permanganate diphenylamine indicator can be used. The blue color is more intense than the pink of potassium permanganate.

Add Stannous Chloride

Determination of total iron in slag as FeO: Dissolve 0.5 gram sample with 30 milliliters hydrochloric acid and 15-20 drops of hydrofluoric acid in a 200 cc erlenmeyer flask. While hot (nearly boiling) add stannous chloride solution dropwise and with stirring until color of the ferric iron is discharged, and then add just one drop more. Cool. Add at one stroke 10 milliliters of saturated mercuric chloride. Stir, wash down the sides of the flask with cold water and allow to stand 2-5 minutes. Transfer to a beaker containing 350-400 milliliters of water. Add 25 milliliters of titrating acid and 3 drops of diphenylamine indicator or sodium diphenylamine sulfonate indicator and titrate to permanent end-point with standard potassium dichromate. Near the end the green color deepens to a blue green or grayish blue. Now add dichromate dropwise until color changes to intense violet blue.

1. Titrating acid—300 milliliters sulphuric acid, 300 milliliters phosphoric acid and 1400 milliliters water.

2. Mercuric chloride—Prepare a saturated solution of mercuric chloride in water.

3. Indicators (a) 1 gram of diphenylamine dissolved in 100 milliliters concentrated sulphuric acid.

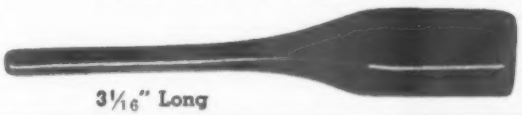
4. Stannous chloride—Dissolve 150 grams of $SnCl_2 \cdot 2H_2O$ in 300 milliliters of hydrochloric acid and dilute to 1000 milliliters with water.

(*Continued on page 182*)

KOOLHEAD FOUNDRY CHILL NAILS

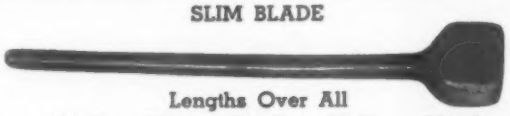
HOT FORGED — COLD FINISHED

GIANT HEAVYWEIGHT HEAD



3 1/16" Long

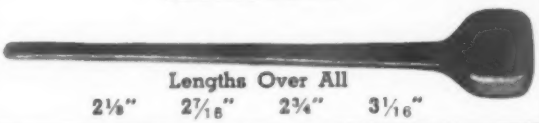
SLIM BLADE



Lengths Over All

1 11/16" 2⅛" 2 7/16" 2¾" 3 1/16"

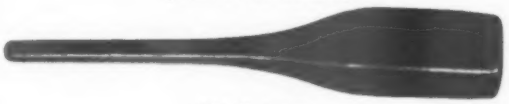
MEDIUM BLADE



Lengths Over All

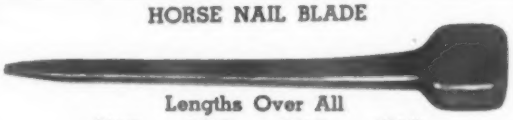
2⅛" 2 7/16" 2¾" 3 1/16"

JUMBO PATTERN



3 1/16" Long

HORSE NAIL BLADE



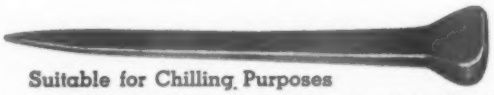
Lengths Over All

2⅛" 2⅜" 2⅝" 2⅞"

LOK - SAND
OR "SCAB" NAIL
Straight or Bent
to Any Angle

3 1/16" Long

HORSE NAIL SECONDS



Suitable for Chilling Purposes
But Not For Shoeing — Sizes No. 5 to No. 11

HORSE NAIL STUBS

Made in Lengths
1" 1½" 2"

FOR OVER 72 YEARS

ESTABLISHED 1872 — STANDARD FORGED — INCORPORATED 1886

MANUFACTURERS OF
HOT-FORGED COLD-FINISHED
HORSE SHOE NAILS

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"KOOLHEAD"

IS THE TRADE NAME OF "STANDARDS"

CHILL NAILS

CLEAN — BRIGHT FINISH — A TYPE
FOR EVERY PURPOSE

•

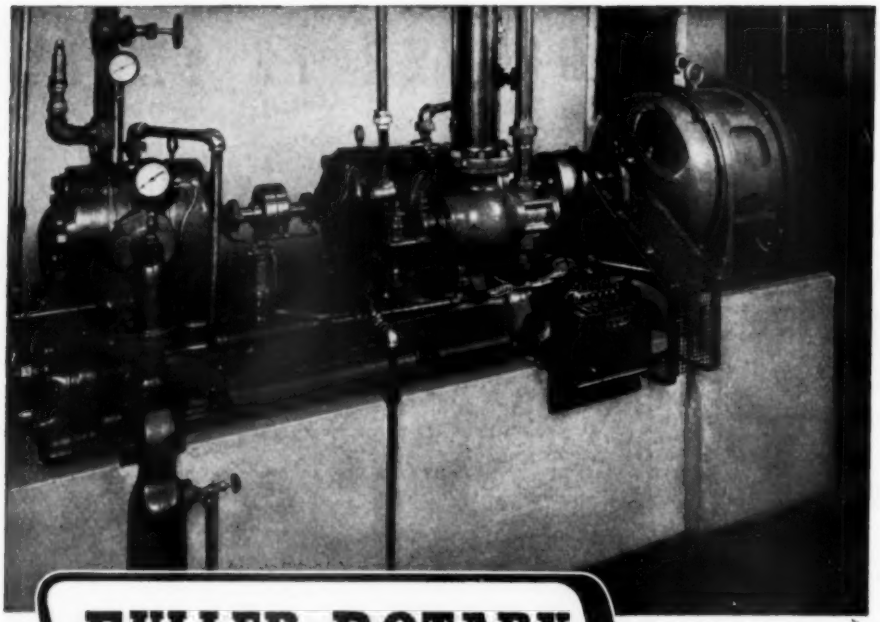
Other "Standard" Products

- DOWEL PINS
- TAPER PINS
- COTTER PINS
- WOODRUFF KEYS
- MACHINE KEYS
- MACHINE RACK

—AND OTHER STEEL SPECIALTIES.

STANDARD HORSE NAIL CORP.

NEW BRIGHTON, PENNA.



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Fuller Rotary Compressors have fewer moving parts . . . rotor—bearings—blades . . . than any other machines for similar service. This mechanical simplicity, together with correct design and precision construction, has contributed to enviable records of long, continuous operation, with minimum maintenance expense.

Fuller Rotary Compressors are built in single and two stage for capacities to 1800 C.F.M., pressures to 125-lb. Vacuum Pump for vacuums to 29.90-in. (referred to 30-in. barometer).

Write for Bulletin C-5. It's yours for the asking.

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CATASAUQUA, PENNSYLVANIA

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C-89

FULLER
PIONEERS OF HIGH-EFFICIENCY ROTARY COMPRESSORS

(*Continued from page* 180)

5. Dichromate solution—Dissolve 3.42 grams of pure recrystallized potassium dichromate in water and dilute exactly to 1000 milliliters. The solution is very stable if care is taken to exclude reducing substances. The theoretical titer is used. 1 milliliter = .0050-gram of FeO.

6. Sodium diphenylamine — Purchase.

NOTES: For determination of total Fe as FeO: (1) A large excess of stannous chloride is to be avoided. In case of doubt the color can be restored by adding a few drops of potassium permanganate and then repeat reduction with stannous chloride.

(2) Sodium diphenylamine sulfonate is to be preferred over diphenylamine as an indicator as mercury ions do not interfere with the former.

(3) Recrystallized potassium dichromate is prepared as follows: Fuse potassium dichromate at lowest possible temperature, break up and dry at 100 to 110 degrees Cent. (212 to 230 degrees Fahr.)

(4) When reducing with stannous chloride, if much chromium is present the solution will turn green instead of colorless.

Determine Iron Oxide

Determination of FeO in slag: Transfer 0.5000-gram sample to a dry 250 milliliter erlenmeyer flask. Add 2-3 grams of anhydrous sodium carbonate; mix; add 30 milliliters of hydrochloric acid and 15-20 drops of hydrofluoric acid. Dissolve on hot plate. Add dissolved sample to 300-400 milliliters water containing 25 milliliters of titrating acid, 5 drops diphenylamine indicator and titrate to permanent end point with standard potassium dichromate.

Solutions: 1. Titrating acid—300 milliliters sulphuric acid, 300 milliliters phosphoric acid and 1400 milliliters water. 2. Bichromate solution—3.42 grams per liter. 1 milliliter = 1 per cent FeO.

NOTES: (1) Always add hydrochloric acid before hydrofluoric acid to prevent spraying hydrofluoric acid on hand. (2) Sodium diphenylamine sulfonate indicator can be used.

Determination of ferric and ferrous iron in slags: Weigh 0.5000-gram of sample and determine—

(1) The ferrous iron as FeO.

Transfer sample to dry 300 milliliter erlenmeyer flask. Add 2-3 grams anhydrous sodium carbonate, mix well. Then add 30 milliliters hydrochloric acid and 15-20 drops hydrofluoric acid. Dissolve on hot plate. Remove from heat, add 100 milliliters of cold water, 25 milliliters of saturated boric acid (prevents interference of hydrofluoric acid) and titrate with a standard potassium permanganate solution (do not use diphenylamine indicator).

(2) The total iron.

To the solution that has been titrated for ferrous iron, add 10 milliliters of hydrochloric acid and reduce with a few drops of stannous chloride. Heat to boiling, oxidize with potassium perman-

(*Concluded on page* 184)

SALVAGE DEFECTIVE ALUMINUM CASTINGS

THIS NEW, FAST, EASY WAY—ASSURES PERFECT FILL-INS EVERY TIME

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Mogul Nervous Weld Machine is a compact enclosed unit with finger tip one dial control. Operation shows repair of cracked cylinder block by this remarkable process.

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This revolutionary Mogul Nervous Weld Process now makes possible for the first time a positive repair of defective aluminum castings so perfect that even photomicrographs fail to show the line of demarcation. You can add aluminum to castings, patterns and filled in aluminum can be drilled and tapped.

Castings reclaimed by this amazing process machine perfectly and permit alumilite plating without hydrogenization taking place on the filled-in area.

The fusion is so perfect with the Mogul Nervous Weld Pistol that the build-up resembles that of the original casting. Further, the aluminum deposit is so dense at the point of fusion that there is no apparent line of demarcation.

Bronze, Grey iron, Malleable and Steel Castings can be reclaimed with equal success.

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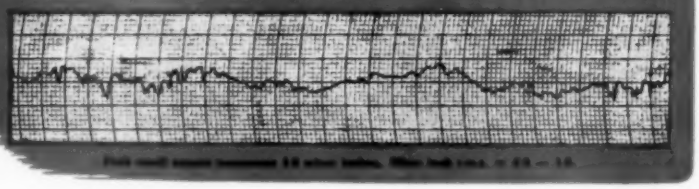

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(*Concluded from page 182*)

ganate, reduce with stannous chloride, cool, add 10 milliliters of saturated mercuric chloride and allow to stand 2-5 minutes. Pour into 350 milliliters of water containing 20 milliliters of titrating acid and 5 drops of sodium diphenylamine sulfonate indicator and titrate with standard potassium dichromate to a deep blue end point.

The difference between the two titrations gives the ferric iron.

Solutions: Same as given under determination of ferrous iron and total iron as ferrous oxide.

Calculation of slag weight: The weight of slag in the furnace may be calculated from the analysis of some constituent which is present in both the metal and the slag and in which the total can be determined in the charge. In the acid furnace this is manganese.

Necessary Data Needed:

(1) Determine the weight of the charge (scrap and pig iron).

(2) Determine the weight of the manganese in the charge.

(3) Determine (or estimate) the weight of the metal before oxidation. Final heat weight minus additions.

(4) Determine the percent of manganese in the slag before oxidation (by analysis) and the percentage of manganese in the metal before oxidation (by analysis).

(5) Calculate the weight of manganese in the metal before oxidation and the weight of the manganese in the slag sample taken before the metal was oxidized.

(6) The manganese in the slag equals total manganese in the charge minus manganese left in the metal.

(7) Convert weight of manganese in the slag into pounds of MnO (multiply by 1.29).

(8) Divide percent of MnO in the slag into weight of MnO in slag to determine the slag weight.

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C. H. Herty, Jr. and others, *The Physical Chemistry of Steel Making*, Cooperative Bulletin No. 68, 1934, Mining & Met. Advisory Board, Carnegie Institute of Technology.

Scott's *Standard Methods of Chemical Analysis*, Vol. I, page 211-212; 473-476; 1205-1210; Vol. II Slag Analysis 2020-2025. D. Von Nostrand Company, Inc. N.Y.C. 1939.

Cramer, C. H., "Rapid Method for Iron in Acid Open Hearth Slags," *Chemist Analyst* Vol. 28 No. 3.

Lundell, G.E.F. and others, *Chemical Analysis of Iron and Steel*. Chapt. VIII, XLIX. John Wiley & Sons, Inc. (1931).

Safety Experiences Of Plants Cited

A pamphlet, entitled "Safety Through Management Leadership," has been issued by the Department of Labor. It is intended primarily for the small war plants which rarely can employ trained safety engineers, and cites the actual experience of plants of various size in organizing for safety. Free copies are available from the Division of Labor Standards, U. S. Department of Labor, Washington 25.

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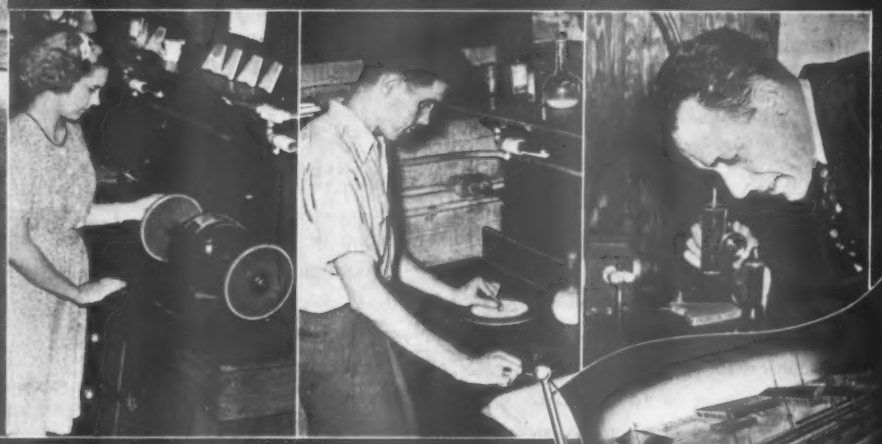

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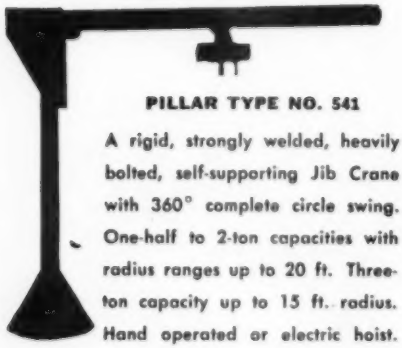

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HOW TO MELT BRONZE FOR CASTINGS

(*Continued from page* 84)

it does not meet all requirements of quality. Otherwise, serious losses can result from the use of inferior ingot.

Where the scrap is carefully purchased and sorted, scrap metal charges may be the cheapest for compounding alloys. Depending on the uniformity and condition of the scrap and the limits imposed by specification requirements, more or less saving can be realized by the foundry. For example, a dealer offering a large quantity of railroad bearing scrap, or a lot of worn-out equipment of uniform type would be a reliable source. The composition of such material readily can be checked by analysis of a few representative pieces. If the scrap consists of large amounts of small miscellaneous pieces, valves, faucets, bolts, wire, door handles, plugs, etc., great care is needed in using it. Large bells are high on the list of good scrap. Almost universally the metal is an alloy of 80 to 85 per cent copper, 15 to 20 per cent tin. Bell metal can be used to raise the tin content of lower quality scrap metals.

Separate Various Alloys

Most particular care and experience is needed to avoid the inclusion of even the smallest pieces of aluminum bronze, manganese bronze or silicon bronze in batches of tin bronze scrap. These metals exert a poisonous effect in tin bronzes. A piece of aluminum bronze weighing only 1 pound would spoil 1000 pounds of otherwise good tin bronze scrap. Large substitution of manganese, silicon and aluminum bronzes for tin bronzes during this war will result in considerable amounts appearing in mixed scrap from now on. Considerable risks are involved in the direct use of scrap metals by a foundry endeavoring to lower its metal costs.

Generally for accurate results in finished castings, it is necessary to premelt miscellaneous scrap, pour it into ingot and analyze the ingot for composition. Therefore, unless a very reasonable price is paid for the scrap, the final cost of castings made from it may be higher than that for purchased ingot because of the extra melting cost and melting loss from two meltings instead of the cost of a single melting of the purchased ingot.

Virgin metal charges usually are most practical where a great variety of compositions are in demand, or where small quantities of special composition castings made to close specification are required. Usually it is too costly to obtain prepared ingot in small quantities to special composition from a smelter,

(*Continued on page* 189)

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Stroman Melting Furnaces are the most modern, efficient and easiest to operate available. Their sturdy construction and fuel saving capabilities have been lauded by many of the leading foundries from coast to coast. YOU should be acquainted with the many outstanding features that combine to make them the greatest labor saving furnaces for the melting of all non-ferrous metals.

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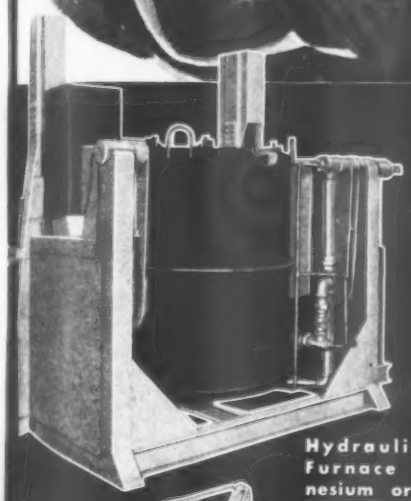
Stroman Engineers are always ready to co-operate with you on foundry layout and metal melting problems . . . their years of experience in the combustion and foundry fields qualify them to consult with you and suggest solutions.



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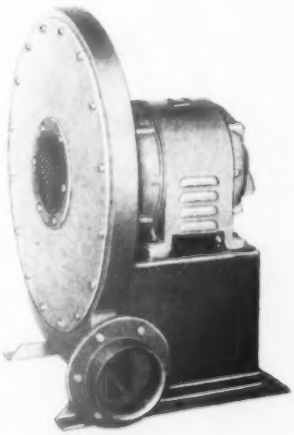

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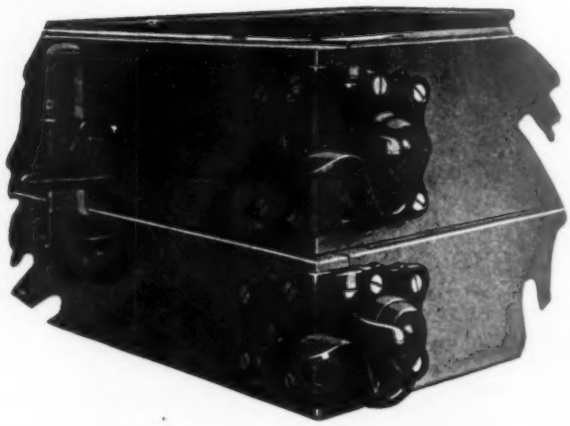
No matter what happens—you'll never be wrong if you equip for production with *good* flasks. Because we can give you many exclusive features in a flask developed over a period of 50 years, it can also be said that, "You can't go wrong on a Diamond," either. Note these important features:



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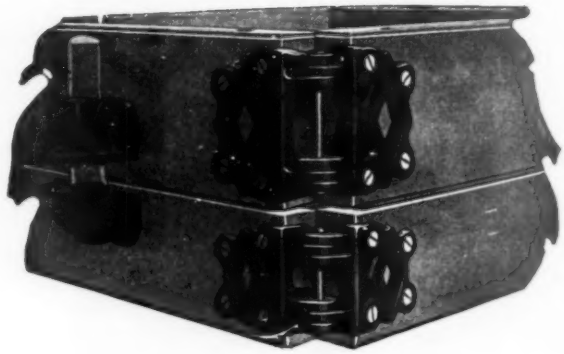

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(*Continued from page* 186)

especially if the distance from the smelter involves high freight rate for small shipments.

If care is used in alloying, melting losses readily are calculated and corrected. Generally it is unnecessary to make a pre-melt into ingot. The castings can be poured from the initially alloyed melt. However, for reasons not fully understood, it is the general experience that the quality of a bronze melted only once from virgin metals is not as good as when it is remelted. More trouble is experienced with absorbed gases and the strength properties are somewhat lower in the single melted alloy.

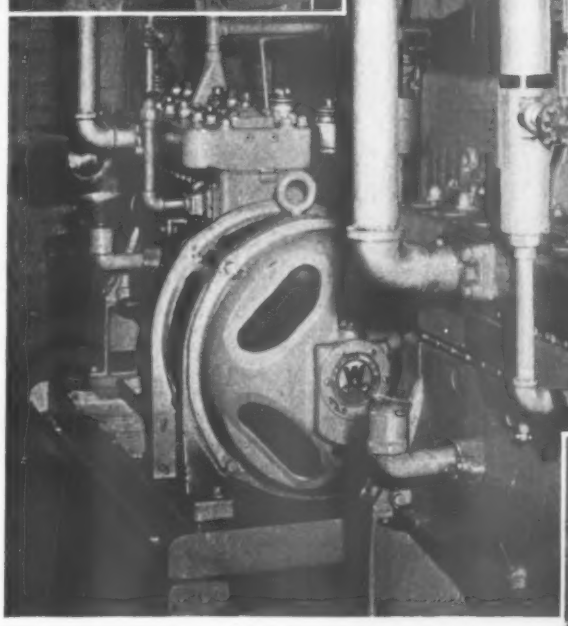
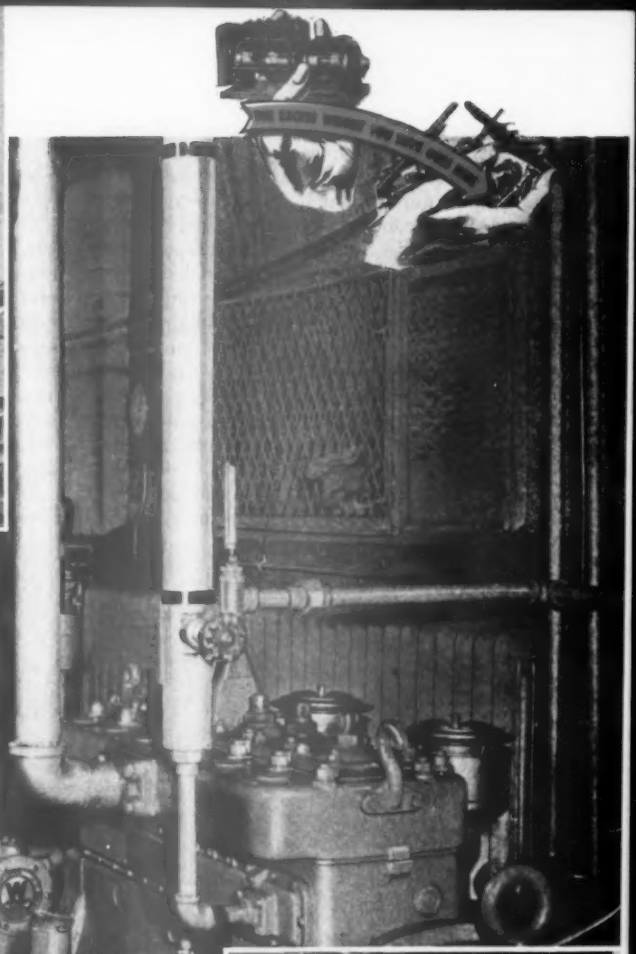
Base metal and hardener method of alloying is favored by some foundries as an alternative to the foregoing methods for production of manganese, aluminum, silicon bronzes and nickel alloys. The hardener method never is used for tin bronzes which all contain metals of low melting point alloyed with copper. The use of a hardener is designed for the introduction of metals of higher melting point than the base metal.

Can Use Hardener

It is cheaper than ingot in freight cost to purchase a rich hardener from a distance and to add this to the base metal (copper, for example) purchased locally. It is also a flexible method. By varying the amount of hardener used, alloys of different physical properties can be produced in a range of grades. In making a hardener it is practical to melt its components at a temperature sufficiently high to alloy the metals thoroughly, but if such a temperature were used to make the bronze with the individual metals no success would be obtained. The hardener may contain excessive gases at the temperature at which it was prepared, but when it is poured into ingot it loses most of this excess gas when it solidifies. Then as only a minor proportion of the hardener is used in making the final bronze, the severe heating that the hardener originally received is not sufficiently serious to affect the bronze which dissolves its components at a moderate temperature.

A typical hardener for making silicon bronze would contain approximately: Silicon 20 per cent, iron 8 per cent, manganese 2 per cent, copper remainder. Using this hardener to make a silicon bronze having the following required composition: Silicon 3.5 to 3.7 per cent, iron 1.3 to 1.5 per cent, manganese 0.3 to 0.5 per cent, copper remainder. We would melt 18 pounds hardener with 82 pounds copper. If the alloy was required to contain some zinc, this metal would be added to the bronze as such and would melt in without difficulty owing to its low melting point.

Similarly, a hardener for making manganese bronze would contain a high

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percentage of aluminum, iron, and manganese plus copper, and a suitable proportion of this would be melted with the required amount of copper and zinc.

Disadvantages of this method are the variable melting losses encountered and the difficulty of getting a final uniform alloy owing to the high melting point of the hardener which, though lower than that of its component metals, is still high enough generally to cause some difficulty in alloying.

Normally, none of the foregoing types of charges are used exclusively. Usually a charge includes a portion of foundry returns from previous heats of the same alloy. Gates, risers, scrap castings, and over-melt represent anywhere from 30 to 80 per cent of the total melt and, of course, it is necessary to reuse this material in succeeding melts.

The melting room foreman prepares metal charges consisting of a proportion of new metal with enough foundry returns of the same alloy to equal the proportion of gates, risers, etc., produced. Badly proportioned charges result in necessitating all new metal melts or all return charges which, in turn, cause unbalanced storage requirements and poorer composition control of the alloys.

Alloys most frequently prepared by alloying single metals are the tin bronzes, including red brasses, bearing bronzes, phosphor bronzes, yellow brasses and architectural bronzes. Because of the wide range of bronzes and brasses, with more or less variation in the tin, lead, or zinc content, it frequently is necessary to add new metals to obtain the desired composition. Average available bronze scrap usually contains 5 per cent or more lead, very often in conjunction with equal amounts of zinc. A good bearing metal should be low in zinc owing to the tendency for this metal to cause seizing of bearings, but bearing metals frequently are high in lead because of the good lubricating properties of this metal. Structural engineering castings of the gun metal types are required to be low in lead because lead reduces strength and impact properties.

While it is possible to lower zinc slightly in melting, very little reduction in lead is possible. Therefore, unless sufficient low lead or low zinc scrap is available, part or all of the charge necessarily will have to be new metals.

Describes Charging Procedure

The best rule to follow in melting is to put all the high melting point metals in the original cold charge. For bronzes and brasses this would include copper along with scrap and returns if these are used. If individual metals form the charge, the copper is melted first. If the alloy is to contain less than 2 per cent zinc, it is advisable to add about 2 ounces phosphor-copper to each 100 pounds of melted copper to deoxidize the copper during its melting. If zinc is to be 5 per cent or more, it is best to add about 2 per cent zinc instead of the phosphor-copper with the cold charge of copper.

For crucible melting with oil or gas about 5 pounds broken glass and ¼-pound borax are added. In addition to the glass-borax mixture, charcoal should be added if coke-fired melting is practiced.

For bronze or red brass, all the remaining zinc is added when the copper is melted. From ½ to 1 per cent extra zinc is allowed for loss. This will complete the deoxidaion by forming zinc oxide which, being very light in weight, will float to the surface and be removed. If tin and lead are added before the zinc they will deoxidize the copper also, but their oxides, being heavy, will remain entangled with the metal to a great extent. Therefore, lead and tin, if required, should be added after adding zinc.

Just before pouring the metal into molds, ¼ per cent phosphor-copper is added to gun metal or red brass and stirred in well. This addition serves to fluidize the alloy and assists in separating heavier oxides and dross as well as causing the bronze to run sharper and cleanly in the gate and mold passages.

(To be concluded)

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Variable Speed

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McCormick Blackings
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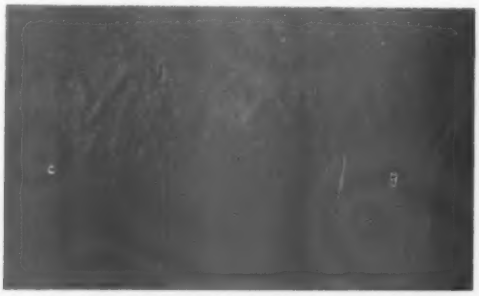
One Blacking is not suited to all sand mixtures and all methods of application

This illustration shows the Blacking "curling" . . . not because the Blacking is inferior but because the kind of Blacking used is not suited to this sand.



This illustration shows the Blacking "running" or "sagging", because the kind of Blacking used is not suited to this sand or to the method of applying it.

Just imagine the number of different sands and sand mixtures to which Blacking is applied—some are strong, some weak, some are wet, some dry.

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FOUNDRY METALLURGY OF DIE CASTING

(*Continued from page* 73)

numbers 1, 2, 3, 4, and 5 are directly controllable by the foundry metallurgist, whose function is to see to it that these factors are controlled daily so that they will not act to cause a variation which might result in the rejection of the final product.

Foundry control in a die casting plant should concern itself with all of the factors mentioned and necessarily should attempt to maintain a control so close that under no circumstances will any of these factors be responsible for the rejection of material.

The die designer and the die caster must be able to depend on it that the metal for which they design and which they use is of extremely consistent quality from day to day. This is necessary because the dies are designed to function successfully when used with metals having certain specific properties in the liquid state and certain specific characteristics in the solid state at high temperatures. Variations in these properties obviously causes variations in the product produced from the die. The die designer assumes that such properties as viscosity, latent heat of fusion, thermoconductivity, and others will be constant for any given alloy for which he designs. Likewise, the die caster depends upon the consistency of the metal he die casts, for when a die first is set up and logged for future use by the foreman and the die maker, conditions they note must, when reproduced later, give results comparable to those desired and decided on. In other words, the performance of the metal must remain a constant.

Therefore the foundry metallurgist responsible for the foundry control has a large task, a task which demands maximum co-operation on the part of management and labor within the plant. Regardless of how insignificant some of the directions set forth for the handling of the metal may seem to those with less specialized knowledge but with more authority, his directions must be followed explicitly if consistency of metal-quality is to be attained.

Factors To Be Considered

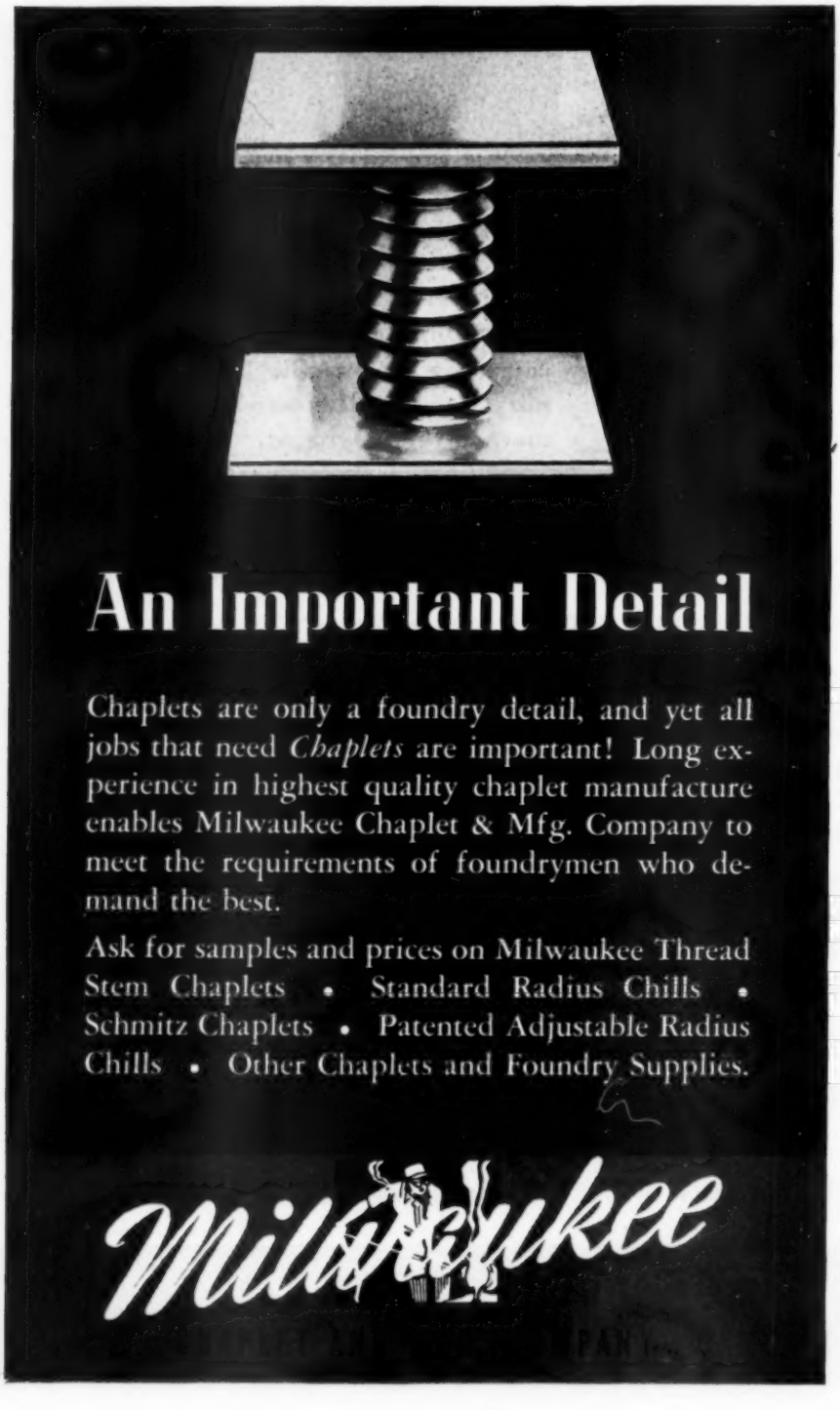
1. *Chemical Composition.* In die casting many of the alloys used are of such a nature that their properties in liquid state remain uniform only so long as their chemical composition is held within narrow limits. This is true of almost all die casting alloys.

What is meant by *certain limits*, and how are these *limits* to be decided upon?

The author suggests that the only way to discover where these *limits* should be set is to perform actual experiments—guided of course by a knowledge of the physical metallurgy of the alloy being investigated. In many cases the literature is abundant with information dealing with the effects of impurities and small amounts of certain alloying elements. A review of this literature often eliminates the necessity of performing many experiments. However, work must be done with an alloy in the die cast state before a statement can be made as to whether or not a variation in the percentage of some alloying element will alter the final physical properties of the casting. Sometimes an experiment will show that limits tentatively set are too strict; sometimes that such limits are too lenient. Using data obtained from sand casting the alloy in question is to be avoided.

2. *Presence of Dissolved Gases.* Presence of certain dissolved gases in many light metals and in certain other nonferrous metals is definitely a factor which plays an important role in die casting these metals successfully. Contamination of any of the metal by gases from furnace atmospheres, from over-humid atmospheres, from substances which tend to decompose to give rise to gases, and from moisture, are to be guarded against. It is true that the problems involved with the (die cast metal)-(gas) system is quite different from the problem encountered in the (sand-cast metal)-(gas) system and that pressure tends to

(*Continued on page* 194)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In designing a new electronic tube, mathematical calculations are invaluable, but as every designer knows, they are but preliminaries. After them, there usually come many tests of various experimental tubes. Machlett thought the cut-and-try method not only wasteful, but not productive of the best results. So we shortened and simplified the procedure by what our laboratory people call the "rubber model."

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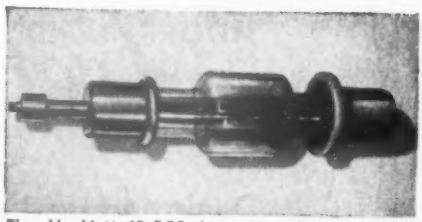
By means of this rubber model technique, months have been shortened into days, weeks into hours. More than that, new and higher performance has been achieved in the final product, so that when you buy a Machlett tube, you are assured of precise results, longer life, greater economy . . . Machlett Laboratories, Inc., Springdale, Connecticut.



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MACHLETT

X-RAY TUBES SINCE 1898

TODAY THEIR LARGEST MAKER

(*Continued from page* 192)

keep dissolved gases in solution, but it has been shown that the presence of dissolved gases and mechanically held gases affects the mechanical properties in various ways—not always for the better, and therefore control over the entrance of gas into the metal must be maintained. This control is of special importance when small gates, less than 0.075 inches in thickness, are employed to make the die castings. In such cases the metal tends to release any gas held in the supersaturated state as it passes through the small gate, due to the sudden pressure drop and the abrupt temperature fall as the metal passes through into the open cavity. Wherever large gates are employed the tendency of any dissolved gas to be evolved is reduced considerably because the pressure applied on the metal during solidification is maintained and because no serious pressure and temperature drop occurs.

3. *Fluxes and Degassers.* Due to the very nature of the die casting process, which requires that metal be held for long periods at temperatures exceeding the melting point, and also to the fact that scrap is made at a great rate, the successful handling of the metal which is to be re-ingoted for further use demands that it be cleaned before it again is delivered to the die casting machine for use. Simply remelting the scrap is inadequate. The scrap must be cleaned, dried, and then refined before re-ingoting. The refining process should remove: a) oxides, b) nonmetallic inclusions, c) hydrogen gas, and d) unwanted compounds such as aluminum carbide and aluminum silicide. Grain size may be refined or the alloy modified when the alloy lends itself to such a procedure. Fluidity or viscosity of the metal may be influenced greatly by the type of refining operation employed. So may be the microstructure of the metal when it later solidifies in the die cavity.

4. *Metal Temperature in Pot and Retention Time.* Temperature at which the metal is held in the holding pot should be controlled directly by the foundry metallurgist. Unless account is taken of the fact that a metal held in the liquid state for long periods of time will, if the temperature favors it, change in its physical-chemical nature, serious results will ensue. For example, if brasses are maintained in the holding pot at a temperature when the vapor pressure of zinc is appreciable, zinc will be lost from the melt. Certain magnesium alloys if held at too low a temperature, i.e., at a temperature near the melting point, for too long a period show segregation. This is true also of certain zinc alloys. Both the temperature at which the metal is held and the length of time it is held play an important role in the production of good die castings.

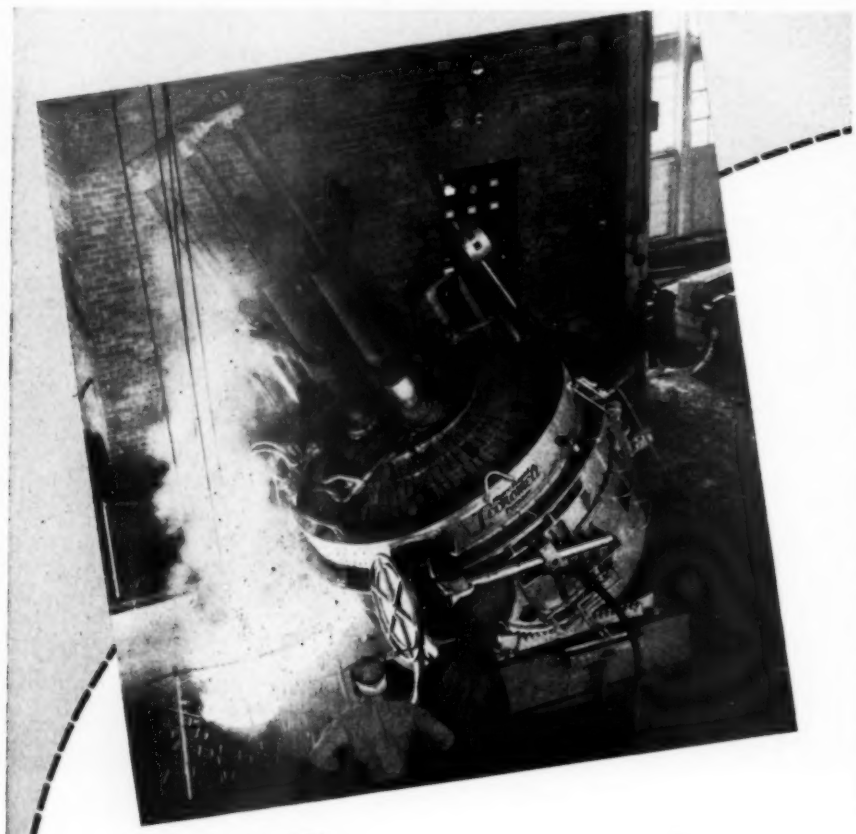
Must Watch Temperature

Altogether too little attention is paid to the time of retention and the temperature at which the metal is held. Dies are changed, machines are temporarily disabled and all the while the metal is still held in the holding pot without any regards for its temperature. Later die casting proceeds and the physical-chemical nature of the metal has been altered.

Type of pot, material the pot is made of, kind of heating system, composition of the gases, type of thermocouple held in the pot, etc., all are factors contributing to the transformation of the metal while it is being held awaiting use. Naturally, as production starts all of these factors become less significant because there is less time for them to act on any given portion of metal since the cycle is usually fairly rapid from ingot to molten metal, from molten metal to small die castings.

5. *Speed of Melting.* Where the size of the casting is large and its manufacture at the machine fast, the metal in the holding pot is withdrawn at the greatest rate. The opposite is true when the die casting is small and a long time is required in the manufacturing process, perhaps because there are several complicated cores or inserts that have to be used. Each of these two cases represents an extreme. In the first case where the cycle of operation is fast, metal must be melted quickly and brought up to temperature. The furnace used must be capable of supplying the necessary heat to do this in a hurry. If the furnace

(*Concluded on page* 196)



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EXCELLENT COLLAPSIBILITY—No Hot Tears and easy Shakeout.
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Marabond replaces all or major portion of oil in Facing Sands—gives faster baking at lower temperature—gives better flowability—and reduces penetration.

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WRITE FOR ADDITIONAL INFORMATION OR SAMPLE

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MARATHON CORPORATION

CHEMICAL DIVISION **ROTHSCHILD, WISCONSIN**

(*Concluded from page* 194)

fails to do this, then the die caster, when he ladles out the metal from the holding pot, carries in the ladle fragments of unmelted metal. Also he simply may ladle molten metal which is not up to the desired temperature. The author has seen some furnaces which were unable to maintain a constant temperature due to the swiftness of the operating cycle. As a consequence successive die castings were made at constantly lower temperatures. In other instances the author has seen the die caster ladle metal out of a pot at a certain rate without pause while the temperature of the metal varied over 150 degrees Fahr., due to the introduction of the ingot metal into the pot. The die castings made were of a very nonuniform quality.

Who is to question the fact that the same operator cannot duplicate his own work from day to day when he is die casting with a metal unlike the one he employed the day before? Who will wonder when two die casting companies fail to turn out identical results from the same die when the operator at one plant operates quickly while the other slowly, or while one ladles very slowly and the other very quickly, or while one continually stirs the metal in the holding pot and the other does not, especially when it can be shown that these seemingly insignificant habits are really not so insignificant, but that they may act to alter temperature, affect gas content, introduce cold shut, etc.?

It is not enough to say a metal temperature of 1350 degrees Fahr. is desired to make this casting. This is inadequate information. Where and when is the metal to be 1350 degrees Fahr.? In the holding pot, in the ladle just before pouring, or in the injection chamber? If in the holding pot, then how is it to be measured? By a sensitive potentiometer or by a crude, hand indicating pyrometer? Is it to be read before or after an ingot metal has been placed in the pot?

Until all of the die casting companies agree on precisely what is meant by *temperature of the metal, temperature of the die, chemical composition, operating pressure,* and *refining of the metal,* etc. it is absurd to wonder at the dissimilarity of results when *identical* operating conditions have been employed in the manufacture of die castings from one and the same die by two different companies.

Furthermore, there are other factors which affect the quality of die cast products as much as do die temperature, pressure applied, metal temperature, and metal composition. These other factors are not well understood. Perhaps they are not all recognized as yet! There is need therefore of caution in speaking of the optimum conditions in die casting. Die casting is complicated; it is not simple. The variables are many and their relation to one another is the subject of much-needed investigation.

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Book Review

Tool Steels, by J. P. Gill, R. S. Rose, G. A. Roberts, H. G. Johnston, and R. B. George, cloth, 577 pages, published by the American Society for Metals, Cleveland. Price $6.00.

Users of tool steel should find this volume of inestimable value in becoming better acquainted with the many types of tool steels produced, and as an aid in solving tool problems. Both theoretical and practical information on the more commonly used types of tool steel are presented, and available data on each steel is presented in the form of graphs and charts where possible. The book is divided into 18 chapters of which the first is devoted to a short history, and the second to a description of the manufacture of tool steel. Classification of tool steels is discussed in the third chapter while methods of testing tools are described in the fourth.

General properties and selection of tool steels, general principles of heat treatment of tool steels, and purpose and effect of alloying elements are given detailed attention in chapters V, VI, and VII. The next seven chapters discuss different types of steels such as plain carbon, chromium and chromium-vanadium, low chromium-nickel-molybdenum and manganese steels, oil hardening nondeforming steels, silicon steels, tungsten finishing steels, and graphitic steels. Chapter XV is concerned with die irons for hobbing and carburizing, low alloy tap steels, non-tempering chisel steels, tungsten chisel steels and wortle die steels. Chapters XVI, XVII and XVIII discuss chromium die steels for cold work, die steels for hot work, and high speed steels.

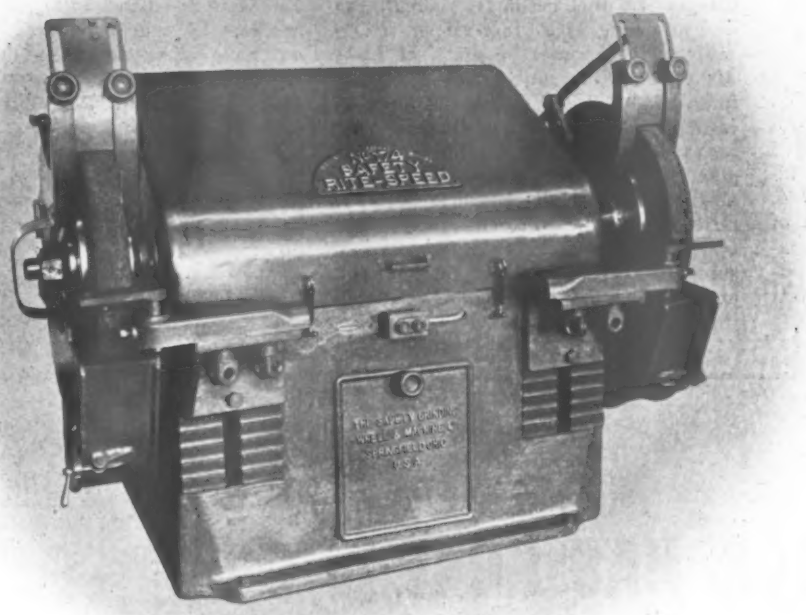
Ship More Aluminum Castings

Shipments of aluminum castings in May totaled 22,350 tons, an increase of 4.2 per cent over April but 10 per cent below the record March level, according to WPB. Shipments of sand castings rose 3.3 per cent, with gains of 7.9 and 2.9 per cent shown for permanent mold and die castings, respectively.

Changes Name

Southern Research Institute is the new name of the former Alabama Research Institute with headquarters at 600 North Eighteenth Street, Birmingham 3, Ala. The institute will function as an agency for research in applied sciences, and operate mainly on the fellowship principle. J. A. Maguire is secretary.

Samuel Greenfield Co. Inc., 31 Stone street, Buffalo 12, has published a 30-page booklet describing analytical methods for nonferrous alloys used in its laboratories. Compiled by Simon D. Zucker, chief chemist of the firm, the procedures are described in brief, concise form.



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ALUMINUM CASTINGS BY DODGE CHICAGO

(*Continued from page* 83)

and 0.20 per cent chromium. A small amount of titanium alloy, containing 5 per cent titanium, is added to the ladle just before each mold is poured, giving the metal a titanium content of approximately 0.12 per cent. An operator stationed alongside the mold conveyor near the melting department carefully weighs out the required amount of titanium alloy addition and places it on top of each mold, as may be seen in Fig. 5. The titanium contributes to the casting's strength, as well as acting as a grain refiner.

Melting equipment consists of eight 3000-pound capacity, gasfired, tilting furnaces. All gates, risers and rejected castings charged in the furnaces first are remelted and converted into ingots conforming to composition of the new metal. The furnace charge is melted and the temperature brought up to 1200 degrees Fahr. for fluxing, subsequently being raised to 1400 degrees for pouring. Seventy-pound capacity ladles are used for pouring, these being carried by a hoist which travels over a monorail loop on the pouring platform, as shown in Fig. 5. The ladle is balanced so that it can be handled by one man, and height of the mold conveyor brings the pouring basin to a level that permits the operator to assume a comfortable position in pouring. Test bars also are poured from each furnace charge.

An exhaust-equipped hood at the pouring platform extends over the top of the mold almost to the pouring cup, effectively withdrawing smoke and fumes generated by the molten metal and burning core oil. Beyond the pouring station the exhaust hood totally encloses the poured molds. The conveyor line and hood back-track after leaving the pouring platform, and the molds can be seen at the extreme right of Fig. 5 as they emerge from the hood. By this time fumes and smoke largely have been dissipated. To hasten cooling of the castings the molds partially are broken open while still traveling on the conveyor, so that by the time the castings arrive at the station where they are removed from the sand they are at handling temperature.

After the sand has been knocked from the castings, the gates and risers are sawed off, and the heads are conveyed to the snagging department for rough finishing on stand grinders.

Clean Up Fins

Metal which has entered the space between the fins at the mold parting line is removed by a thin abrasive wheel on a special machine. This machine is indexed so that the wheel can be inserted only between the fins and for only a certain depth. When the gates and risers, which constitute about 30 per cent of the weight of the poured metal, are removed from the castings they are dropped into buckets suspended from a monorail conveyor and transported to the remelting furnace for refining and casting into ingots. This furnace is equipped with an automatic pouring device for filling the ingot molds which travel on a conveyor past the tapping hole.

Sand from the molds is conveyed by belt under the foundry floor to the reclaiming system where large lumps are broken up and foreign material is removed. The sand then is subjected to a high temperature in a round, multiple-hearth furnace which burns out combustible matter, at the same time removing excessive fines. A more detailed description of this unit was incorporated in the article on the Dodge Chicago Plant magnesium foundry in the August issue of THE FOUNDRY.

The snagged castings next are put through an abrasive blasting machine, after which they are pickled. Cleaning by immersion in a caustic soda bath precedes the dipping in a nitric acid solution and rinsing in hot water. From

(*Concluded on page* 200)

COTTON DUCK HAS GONE TO THE FRONT!

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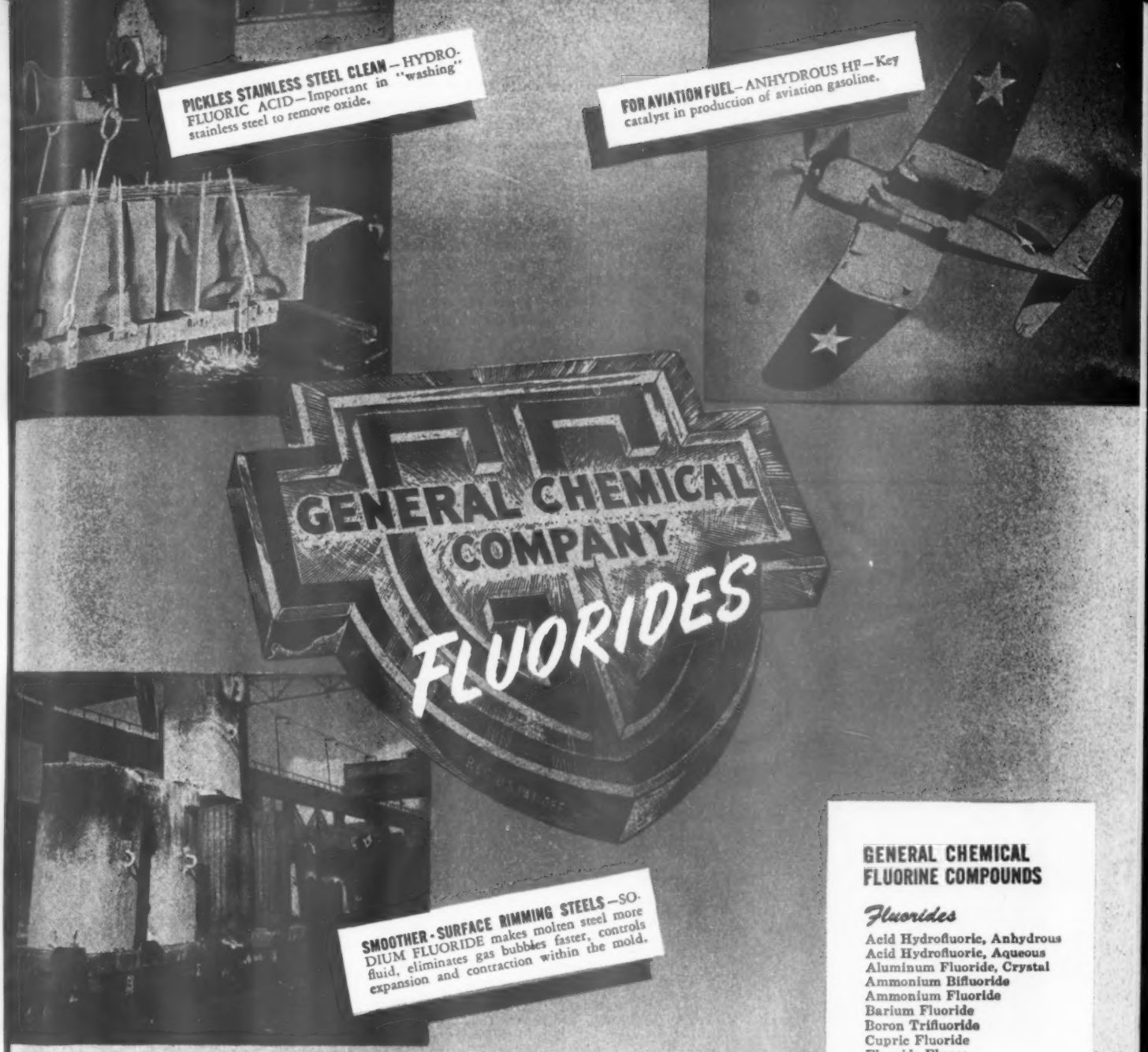
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Potassium Fluoride, Crystal
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Sodium Fluoride
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Cadmium Fluoborate
Chromium Fluoborate
Copper Fluoborate
Ferrous Fluoborate
Indium Fluoborate
Lead Fluoborate
Nickel Fluoborate
Potassium Fluoborate
Silver Fluoborate
Sodium Fluoborate
Stannous Fluoborate
Zinc Fluoborate

Fluosulfonates

Acid Fluosulfonic

(*Concluded from page* 198)

the pickling station the castings are carried on L-shaped hooks by monorail conveyor to burring benches, a section of which appears in Fig. 6. Although not shown clearly, the castings arrive as the conveyor travels to the left on the opposite side of the bench in the foreground of this view.

At the burring benches the heads are clamped on a chuck affixed to a work holder which permits them to be held rigidly in almost any position while the fins and other surfaces are smoothed by electrically-driven rotary files, as shown in Fig. 3. Work stations are highly illuminated by fluorescent lights. After burring, the castings are returned to the conveyor, taken to the polishing department for buffing, and subsequently are conveyed to the heat treating department.

In the as-cast condition the castings have a tensile strength of about 23,000 pounds. This is raised to above 30,000 pounds by solution and ageing heat treatments, which are provided by three electrically-heated batch-type furnaces. Two of the three units are shown in Fig. 7. Furnace racks are loaded with about 70 heads and their corresponding test bars, and given an initial heating of 950 degrees Fahr. for 10 hours in the left half of the furnace. The heads then are withdrawn and allowed to cool in air for 2 hours, after which the racks are switched to the right side of the furnace for an ageing treatment. The latter consists of heating for 4 hours at 520 degrees. Upon its completion the racks are removed, the castings are allowed to cool, and after a final abrasive blastings are given a final inspection.

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Fellowship Permits Sand Control Study

National Engineering Co., Chicago, has contributed $20,000 to the Northwestern University Institute of Technology, Evanston, Ill., to provide a capital fund for the establishment of the Peter L. Simpson Memorial Fellowship.

The fellowship is for the use of the institute and is particularly subscribed to the mechanical engineering department where it will be used by graduate students for research in foundry sand control. The fellowship provides that a graduate student will do pure research on that subject in the Northwestern University foundry and other locations. Information developed will be incorporated in a paper, which will be presented to the American Foundrymen's Association annually before the first of March. The research will be made public under the name of the Peter L. Simpson Memorial Fellowship at the annual A.F.A. convention each year. The fellowship will run indefinitely.

By the provisions of the agreement between the National Engineering Co. and the Northwestern University Institute of Technology, the A.F.A. has been named contingent beneficiary in event that the Northwestern University ever should relinquish its mechanical engineering department or find the fellowship is of no practical benefit. The agreement also suggests that close cooperation be maintained between the technical institute and the A.F.A. in the matter of conduct of the fellowship.

It is particularly fitting that this fellowship should be named for Peter L. Simpson, one of the original pioneers in foundry sand control in the United States. Mr. Simpson was the father of Herbert S. Simpson, National Engineering Co., and past president of the A.F.A., and the grandfather of Bruce L. Simpson, president of the National Engineering Co.

Magnesium Casting Shipments Drop

Shipments of magnesium sand castings continued to decline in May, according to WPB, totaling 6,664,000 pounds. This compares with 6,918,000 pounds in April and with only 4,652,000 in May, 1943. Shipments of permanent mold castings increased 24.4 per cent over April to 514,000 pounds, while die casting deliveries dropped 5.4 per cent to 175,000 pounds.

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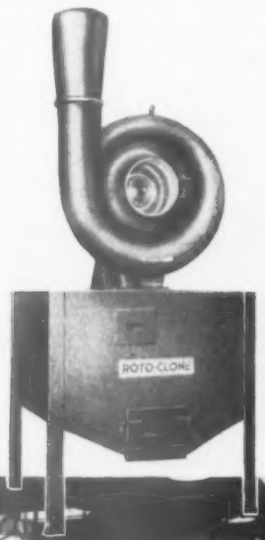
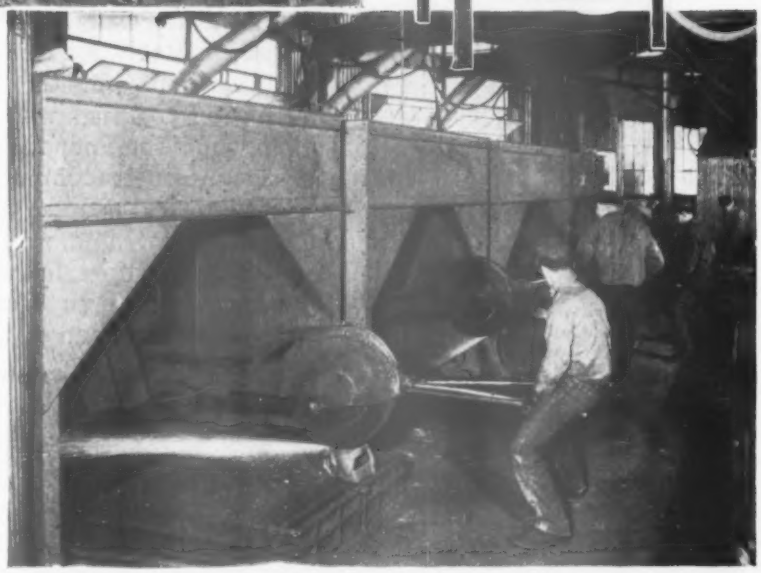
The superior performance characteristics of the Type D Roto-Clone, the minimum of space required for its installation, and the savings effected in piping and power make it especially suitable to swing frame grinder dust control.



COLLECTING SWING FRAME GRINDER DUST is no problem with Roto-Clone on the job. All dust is confined within booths and the finest particles collected by the Type D Roto-Clone combined exhauster and dust collector, thus preventing the dispersion of grinding dust to the work room. Shown on this page are two typical Roto-Clone set-ups illustrating two types of booth enclosures for the grinders. Complete engineering data describing the use of the Type D Roto-Clone for other foundry applications is available on request.



ROTO-CLONE
For Foundry Dust Control

FUNDAMENTALS OF CUPOLA PRACTICE

(*Continued from page* 79)

have made a case for the selection of a 7.5 pound coke unit per square foot of cupola area, how do we determine the size of the metal charge? We have two methods of approach, one "cut and try" and the other based on the amount of coke which, combining with air to generate heat, will melt and superheat iron to a satisfactorily high temperature to which will be added the exact amount of coke that will be dissolved in the melting operation.

In the "cut-and-try" method we may assume that the "apparent fuel ratio," which includes coke for heat and for solution, need not be less than 8.5 to 1, and over a period of time we gradually can improve this ratio in small steps from 8.5 to 1, to 9 to 1, to 9.5 to 1, stopping only when we are sure that we have achieved the optimum performance. In this procedure the coke charge always is the same, say 95 pounds for a 48-inch cupola, while the iron charge steadily is increased.

The other method means that we must know how much coke, which when combining with oxygen to generate heat, is required to melt and superheat iron and also how much coke will be dissolved in the melting process. It takes close to 140 pounds of coke reacting with oxygen to melt and superheat 2000 pounds of iron to 2850 degrees Fahr. Thus if no coke were dissolved in iron the "actual fuel ratio" might be 14.3 to 1. In most cupola operations the metal will absorb from 0.75 to 1 per cent carbon. Since this represents 15 to 30 pounds of carbon, or 16.7 to 33.3 pounds of coke, the 140 pounds of coke reacting thermally must be fortified with some 16.7 to 33.3 pounds of coke, or a total of 156.7 to 173.3 pounds of coke per ton of iron. Therefore, while the "actual fuel ratio" is 14.3 to 1, the "apparent fuel ratio" varies from 12.7 to 1 to 11.5 to 1.

Yes—but you say we are not getting fuel ratios anything like 11.5 to 1 or 12.7 to 1. Well why aren't you? In the first place, you are not using fuel units of 7.5 pounds of coke per square foot of cupola area, you are using fuel units of 19 or 24 or 27 pounds or something else, as was the case in the three 72-inch cupolas discussed previously. You may be one of those who are not weighing materials accurately. Much more carbon can be absorbed in the cupola melting process than the 16.7 to 33.3 pounds per ton of metal that were used to illustrate the point. For example, I have seen the carbon content of a complete cupola charge be 0.5 per cent and the carbon content of the cupola product 3.6 per cent, an absorption of 3.1 per cent which is equivalent to 70 pounds of coke per ton of iron. Furthermore, you probably favor a heavy hand on the coke fork because fuel is one of the less costly items making up the cost of gray iron castings, with the result that fuel is burned in incomplete combustion.

Consider Dimensions

In addition to accurate weighing of materials and the use of proper weights of fuel and metal charges, materials should be of reasonable physical dimensions. For instance, the maximum linear dimension of the materials in the iron charge might well not exceed 30 per cent of the cupola diameter, or 14.5 inches for a 48-inch cupola. It should be pointed out that a cube, 12 x 12 x 12 inches, does not mean a maximum linear dimension of 12 inches, since the maximum diagonal of this cube is about 21 inches. A good guide on the physical size of coke is that an indiviudal piece should weigh not more than 1.5 pounds for a 72-inch cupola or a maximum of about 0.75 pounds for 48-inch cupolas. It would be desirable to have screened coke of uniform particle size. Don't be shocked if you go out to your coke pile and after selecting some pieces find they weigh 5 to 10 pounds or more. And don't be surprised if you have trouble with the cupola bridging, or with cold iron, etc., because the weights of the

(*Continued on page* 204)

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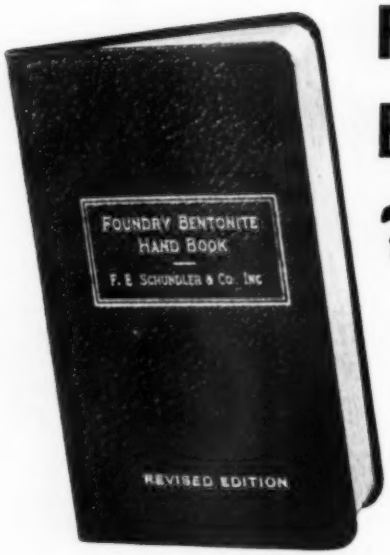

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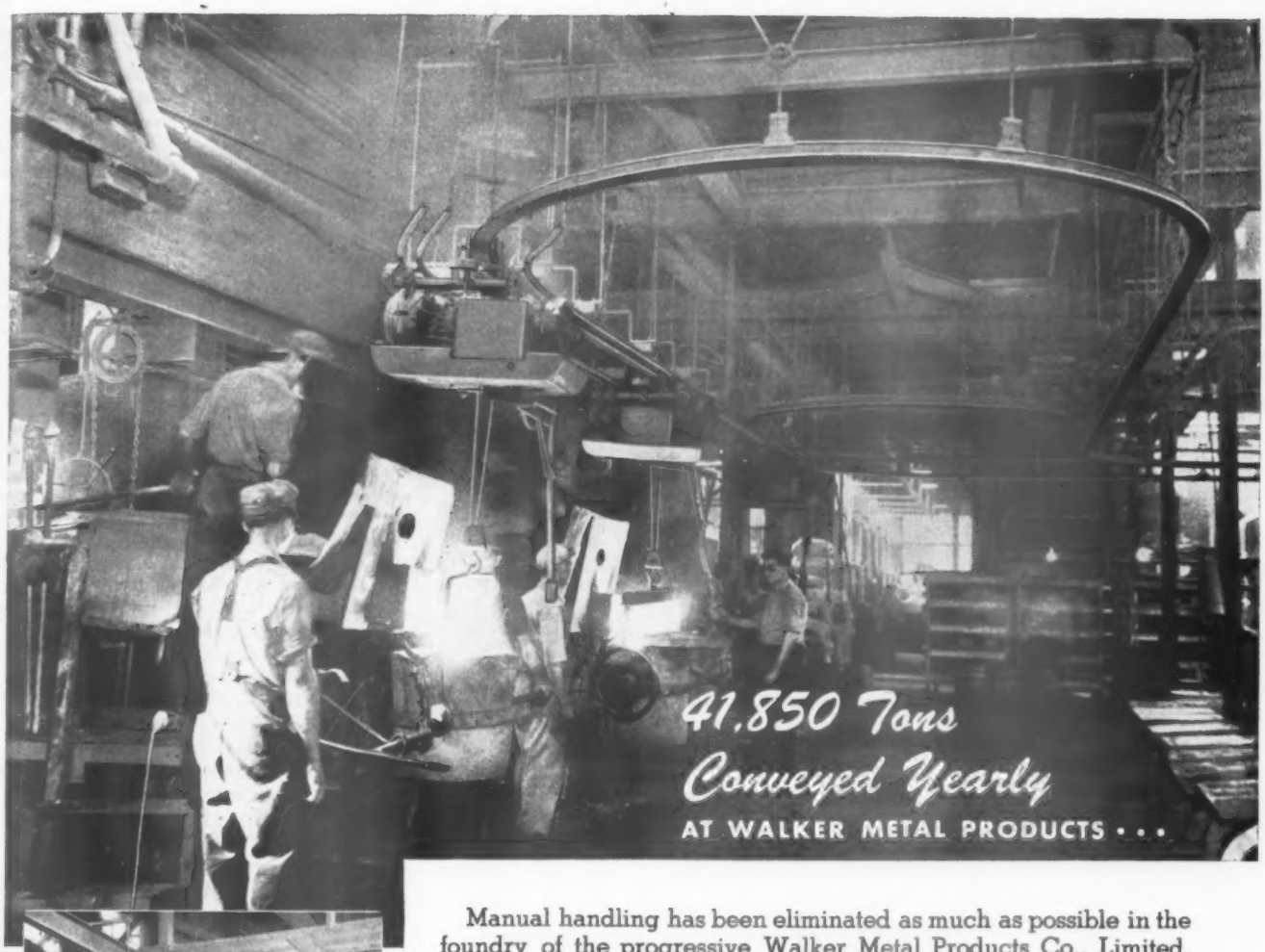
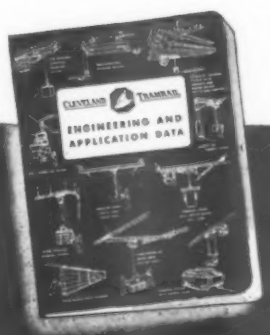


Manual handling has been eliminated as much as possible in the foundry of the progressive Walker Metal Products Co., Limited, Walkerville, Ontario, Canada. The molds are kept moving on continuous mold conveyors and all hot metal is transported over the Cleveland Tramrail overhead materials handling system.

The Tramrail System is so laid out that hot metal can be delivered to each of the mold conveyors directly from the cupolas and poured into the molds while on the move without rehandling. The molten iron is transported on one track and the empty ladles returned on another. Five one-ton hand-propelled carriers with push-button-operated hoists are operated continuously.

Much heavy lifting, pushing, lugging, common in most foundries, has been eliminated and such efficiency introduced that the motor blocks, cylinder heads and other castings are made in a fraction of the time ordinarily required.

A high rate of production has been maintained ever since the Cleveland Tramrail system was installed in 1929. Approximately 150 tons of metal are transported over the main tramrail line every 16-hour working day, or 41,850 tons per year.



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THE CLEVELAND CRANE & ENGINEERING CO.
1155 EAST 283RD ST. WICKLIFFE, OHIO.

CLEVELAND TRAMRAIL
OVERHEAD MATERIALS HANDLING EQUIPMENT

(*Continued from page* 202)

pieces in the coke pile tell you the same thing.

We have given a lot of attention to the materials that go into the cupola but isn't it sound reasoning that if we plan our campaign carefully the execution of it should be relatively simple? Actually most of the essential elements of good cupola practice are incorporated in the three fundamentals just discussed.

When these materials are placed in the cupola they must be distributed uniformly over each square foot of area or the melting performance will be below par. Poor charging certainly can drag the operations down to an unbelievably low level. The hazard of poor charging is not so great with hand charging as it is with mechanical charging, but this reference to hand charging actually means the positioning of all the materials in a complete charge in the cupola from some position outside the cupola by hand. All other methods of positioning materials in the cupola fall under the term "mechanical charging". You may be up-ending an industrial car or using an industrial truck, or putting some materials in by hand and others by some mechanical device, or using a skip charger or a bucket charger with the many modifications of this type of equipment. If coke is all on one side of the cupola and iron on the other side you might rightfully wonder how the heat from the coke ever is going to melt the iron. As a matter of fact, the only way that heat from the combustion of coke will melt iron is to distribute both the coke and the metal uniformly over the cupola area.

This is no reflection on mechanical charging of cupolas, because it is possible for mechanical equipment to do a completely satisfactory job of cupola charging. However, many mechanical devices do not do a satisfactory job of charging and have proved serious handicap to cupola operations.

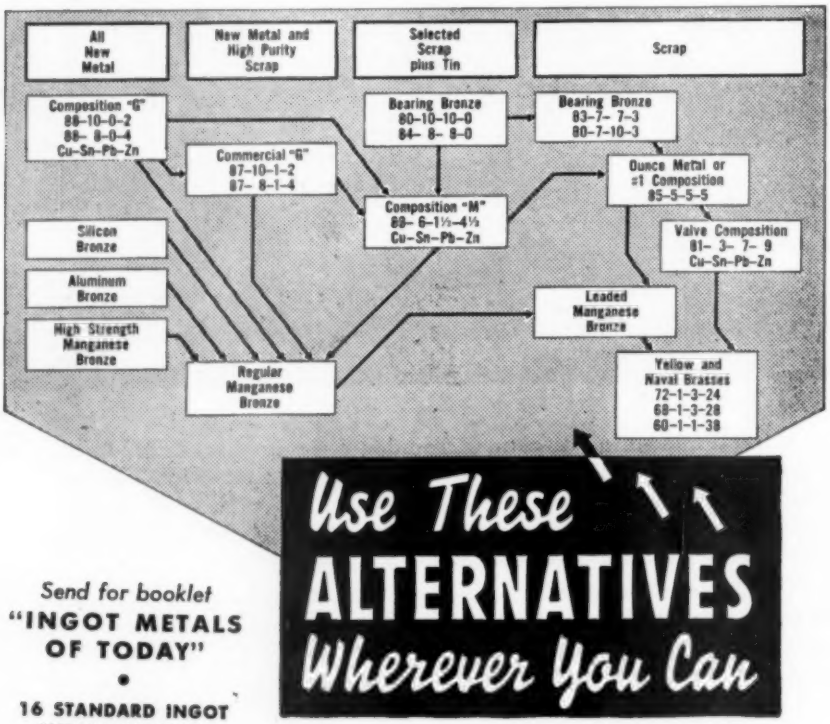
What is the proper coke bed height for a cupola? By coke bed height is meant the distance in inches between the top of the main row of tuyeres and the top of the coke bed. If upper tuyeres or several rows of upper tuyeres are used, the dimension still is measured from the top of the main row of tuyeres. Bed heights in cupola practice range anywhere from 24 inches to 80 inches and, depending on the type of operation, any one of these dimensions might be proper for a specific operation. I prefer to determine bed height by the formula $BH = 10.5 \sqrt{P} + 3$ when it is desired to produce low total carbon irons on the first iron out of the cupola, or $BH = 10.5 \sqrt{P} + 6$ for medium carbon irons; P being pressure in ounces as measured at the cupola windbox.

Bed Height Important

With windbox pressures of 9, 16 or 25 ounces, the respective bed heights would be 34.5, 45 and 55.5 inches for low carbon irons or 37.5, 48 and 58.5 inches, respectively, for medium carbon irons. The coke bed height is measured after the whole coke bed has burned through white hot and with a tolerance not exceeding ± 2 inches. You will note that I consider the coke bed height particularly important in making low carbon irons in the first iron melted.

There are numerous other ways to establish a proper coke bed height by "cut and try" methods. If iron begins to accumulate at the tap hole 8 minutes after the wind goes on, by stop-watch timing, the bed is of the proper height; if more than 8 minutes the bed is too high and this time actually may be 20, 30 or 40 minutes. If one looks through the peepholes in the tuyeres, iron should be seen 4½ minutes after the wind goes on, and if the time is shorter or longer the bed is too low or too high. Having used this formula for a number of years with success it can be recommended as a very satisfactory method of determining the proper bed height for any cupola operation, although the cupola pressure must be known.

What is a proper technique for burning in the coke bed? It is immaterial whether the coke is ignited with a wood fire or with an oil torch. Since the tuyeres are some 12 to 24 inches above the sand bottom and since combustion air enters at the tuyere level, how can one get coke as hot in the lower portion of the well zone, particularly at the sand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NOTE

•"Proper Melting Decreases Foundry Losses," contains interesting data. Also, the booklet, "Nonferrous Ingot Metals of Today." Write for both of these. They are free.

Notice how the arrows on the W.P.B. chart point to the *right*. . . . They show how alternative materials *currently available* can be utilized by foundrymen as now permitted by many designers. The purpose is to conserve primary metal at the mine through increased use of secondary ingots. Sometimes great ingenuity is called for, yet remember this:

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bottom, as it is just above the tuyeres? The coke cannot burn at the level of the sand bottom unless it can get fresh air. If the tap-out block or breast is put in after the bed is burned through, this large opening helps to get fresh air where it is needed, or two or three openings can be provided at this level which can be filled up with refractory before the cupola goes into service.

A fire grate may be made by putting bars through the tuyeres to support the coke at and above the tuyere level, and these bars can be removed after the bottom coke has reached incandescence. The cupola refractories in the well zone, both side walls and cupola bottom, are insulating materials and must be exposed to incandescent coke for a period before their "heat capacity" has been reached and the surface temperature is as hot as one can get it with coke. When iron melts it accumulates in the hearth or well zone, and if temperatures in this zone are considerably less than that of the iron, the heat capacity of the molten iron will be used to heat refractories and some or much of the first iron tapped will be too cold to use. Refractories in the well zone of a cupola should be exposed to high temperatures for 5 or 6 hours if optimum metal temperatures are to be attained on first metal tapped.

Describes Cupola Zones

There are five zones in a cupola. The first zone from charging door down to melting zone is a preheating zone where stock is preheated by the cupolas waste gases. The next zone is the melting zone where metal is converted from the solid phase to the liquid phase and leaves this zone at its fusion temperature. If a piece of metal is suspended so that it is heated from underneath and a melting flame, such as an acetylene torch, then is applied, little globules of metal will drop off when the melting point is reached and unless the metal passes through a high temperature zone it will revert from the liquid phase to the solid phase, i.e., it would freeze. The fusion point of ferrous metal melted in a cupola ranges between 2050 and 2300 degrees Fahr., depending on its chemistry.

The third zone is a superheating zone, and it is this zone we modify when we use sized coke or vary the amount of air going into the cupola. As iron is dropping by gravity through this zone, the amount of superheat added to the iron, whether it be 500, 600 or 700 degrees Fahr., will depend on the temperature in this zone and on the time (that is distance) that it takes iron to pass through this zone. When we strive for perfect combustion or the maximum heat release per pound of coke, or preheat air, we are trying to reach the optimum temperature possible from the combustion of coke. When we establish the proper bed coke height for the type of operation, we actually use less bed coke when we use low quantities of air and more bed coke as the quantity of air is increased. Actually we are either decreasing or increasing the time (i.e. length of the superheating zone) that iron is exposed to superheating temperatures. With the time short the degree of superheat is low, and when the time is long the degree of superheat is high.

The fourth zone is the tuyere zone, and this should be considered as a drastic cooling zone, since approximately 1 pound of room or outside temperature air (or possibly some preheat temperature of the order of 500 degrees Fahr.) enters this zone for each pound of metal passing downward through this zone. It is quite possible that this zone depresses the metal temperature by 150 degrees Fahr. Some might question whether the bessemer reactions of air (oxygen) with the carbon and silicon content of the metal might not actually raise the temperature of metal in this zone, but the bessemer reactions take time and the time interval of metal passing through this zone is too brief. We also know that no appreciable bessemer reactions take place, otherwise silicon losses would be great and the cupola melting process would not be equally adaptable to melting 0.5 per cent to 14.0 per cent silicon metal.

The fifth zone of the cupola is the hearth or well zone. This zone is a "cooling zone" to an appreciable degree and it also is a zone where the carbon content of the metal tends to reach the

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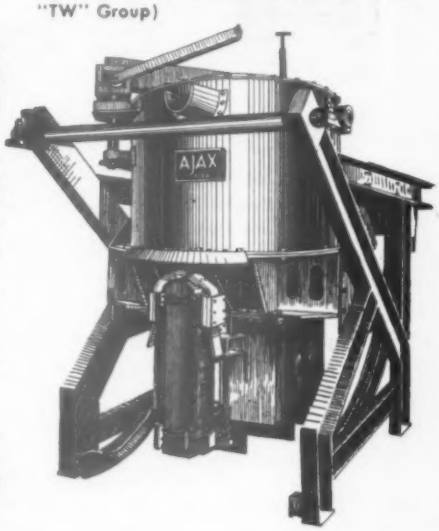

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saturation point for its composition.

Probably more engineering mistakes are made in selecting a blower and motor and in the design of the piping between the blower and cupola than in any other part of the engineering work concerned with a cupola installation. A satisfactory blower should be capable of delivering the maximum quantity of air that good cupola practice ever will require, and be able to deliver this quantity of air against whatever resistance is encountered in good cupola practice. It should be driven by a motor of sufficient horsepower for the maximum work load of the blower.

One could build the best automobile engine in the world but it would still be practically a useless machine if a deficient carburetor would not permit air and gasoline to become properly proportioned and mixed over the complete fuel consumption range. The rate of fuel consumption in the cupola is a variable somewhat like the rate of fuel consumption in an automobile. In the automobile the rate is varied by calling for more or less fuel with automatic adjustment of combustion air, while in the cupola the rate is varied by adjusting the air input with an automatic increase or decrease in the rate of fuel charges reaching the combustion zone.

Nobody would condone a deficient carburetor on his automobile engines, nor would we condone a deficient cupola blower if we had enough facts on the requirements to enable us to choose the proper blower.

To many, air not only is odorless and colorless, it also is mysterious. It has weight, one cubic foot weighing about 0.075 pounds, or about 13 cubic feet of air to the pound. It was stated previously that a cupola will melt 0.75-tons of iron per hour per square foot of area, though some types of cupola operation are of the order of 1 ton of iron per hour per square foot, and it also has been stated that close to 1 pound of air enters the cupola for each pound of metal melted. Thus the air requirements might be stated as 0.75 to 1.0 tons of air per hour per square foot of cupola area. This figure reduced to pounds of air per minute would mean from 25 to 34 pounds of air per minute per square foot of cupola area; or in volume, from 325 to 440 cubic feet of air per minute per square foot of cupola area. For a 48-inch diameter cupola having an area of 12.57 square feet, this would mean a nominal requirement of close to 4000 cubic feet per minute or a maximum requirement of 5500 cubic feet per minute.

Varies as the Square

The resistance of this 48-inch cupola with its nominal air supply of 4000 cubic feet per minute would be close to 16 ounces. If this air supply were reduced 50 per cent the pressure, which varies as the square of the volume, would be $(0.5)^2$, or 2 per cent of 16 ounces—namely 4 ounces. However, if the volume were increased 50 per cent to 6000 cubic feet per minute, the pressure would be $(1.5)^2$, or 2.25 times 16 ounces—namely 40 ounces. With a 50 per cent increase in the load and a pressure 2¼ times the normal load of 4000 cubic feet per minute and normal pressure of 16 ounces, the motor horsepower at maximum conditions would have to be something like 3.3 times the motor horsepower sufficient for nominal conditions.

It may not always be sound to provide blower capacities and horsepowers to suit the maximum conditions but it certainly would be sound judgment to provide for some contingencies above and beyond normal requirements. In most cases the provision made for the blower and motor hardly is sufficient for normal demands.

The subject of cupola practice is so broad that it cannot be done justice in a brief article. Many other subjects, such as tapping methods, fluxing, preheating, air conditioning, carbon control, relationship of mixing ladle capacity to size of cupola, desulphurizing, possible mixtures and types of iron that are cupola melted, slag handling systems, and air quantity controls, are of interest and importance in the melting of gray iron. However, the fundamental phases touched upon are worth checking into, and the operator whose cupola practice does not match these standards described can well afford to make every effort possible to meet them.

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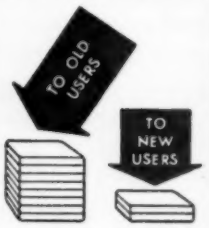

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STOPPER HEADS EXAMINED BY X-RAY

(*Concluded from page* 69)

instances the voids extended to the surface of the head or very nearly to the surface. Heads with such defects undoubtedly gave trouble when used.

Since internal defects of castings are disclosed by nondestructive testing, such as gamma-ray or x-ray examination, a similar study was proposed for the inspection of stopper heads. Short wave-length gamma rays were found to be less satisfactory for the examination of materials of densities of graphite-clay mixtures than the longer wave-length, low power x-rays. Satisfactory results were obtained using the x-ray unit in our dispensary which is used for chest examinations. This is a 200-milliampere fluoradex unit made by Westinghouse X-Ray Corp.

The stopper under inspection is placed perpendicularly in the position of application to the rod, on a cassette containing the x-ray film. A 3-second exposure is sufficient for a satisfactory negative which readily discloses any internal defects in the stopper head.

Fig. 1 illustrates a type of defect which was encountered frequently. Discontinuities of this type at times extended very nearly to the surface of the head. Such a stopper head would quite likely be a source of trouble.

Fig. 2 illustrates another type of defect which was also found in numerous cases. In many other films numerous random voids were found. Fig. 3 illustrates a head which is free from internal defects.

The degree of judgment in evaluating the negatives of course becomes strengthened by experience. Minor voids may be tolerated depending upon their size, distribution and location. Stopper heads whose ex-ographs show large defects, or defects forming planes of weakness, or combinations of defects which could prove troublesome, are discarded.

All stopper heads used in our plant are numbered serially, and are inspected by the x-ray method. The storekeeper and supervisor of ladlemen are each given a list of stopper heads which have been examined showing the serial numbers of the heads satisfactory for use and the serial numbers of the heads not satisfactory for use. At the time this system was instituted the percentage of rejects was quite high. In recent months the percentage of rejects has declined sharply. This, no doubt, has been brought about by more rigid inspection and closer production controls by the stopper head manufacturers.

This system has been in effect in our plant for a year and a half and the results have been most satisfactory. Our records show that since the introduction of x-ray inspection there have been no serious stopper troubles; in fact, we have had a tremendous decrease in leaky stopper episodes. In view of our previous experience the performance since the new inspection was started has been nothing short of remarkable.

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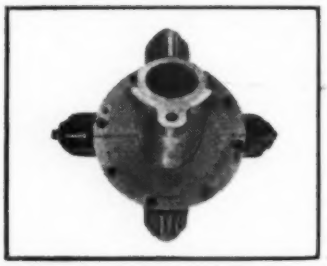

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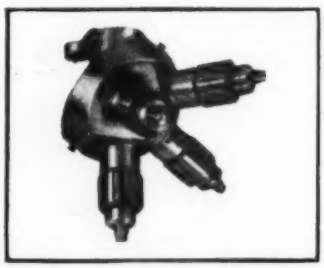

Quadrill assembly complete ready for attachment to drill press

Y-140

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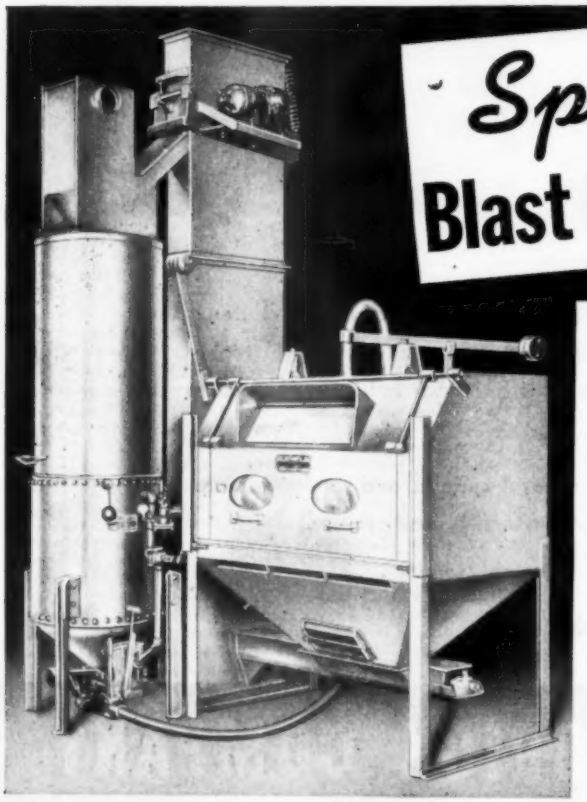

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GRAY IRON AND PRICE STABILIZATION

(*Continued from page* 78)

which the foundryman was using on Feb. 1, 1942. I do not see anything wrong with that, if that were the whole story. Unfortunately, it is not.

When we come to the base period pricing of castings of MPR 244, and the relief provisions and how these are administered, I have more complaint.

By that formula method of pricing the foundryman is required to use the direct wages based on the scale he was paying on Feb. 1, 1942, yet since that time there have been many substantial increases in wage scales to foundry labor. Some of these took place before approval was necessary by the War Labor Board, and some since, but all of which the foundryman was utterly powerless to prevent.

As a net result these raises in wages come out of profit which the foundryman would have made if he had produced the castings in January, 1942. And yet the Statement of Considerations shows on page 14, that in January, 1942, the average profit for the sample of the industry of 487 foundries was 8.8 per cent on sales before tax.

This document shows in the table on page 14, that the average profit for this sample for the four years, 1936 to 1939 inclusive was 4.0 per cent, and this figure has been accepted by OPA as the representative profit for our industry—about which I will have more to say later.

Is Working Hardship

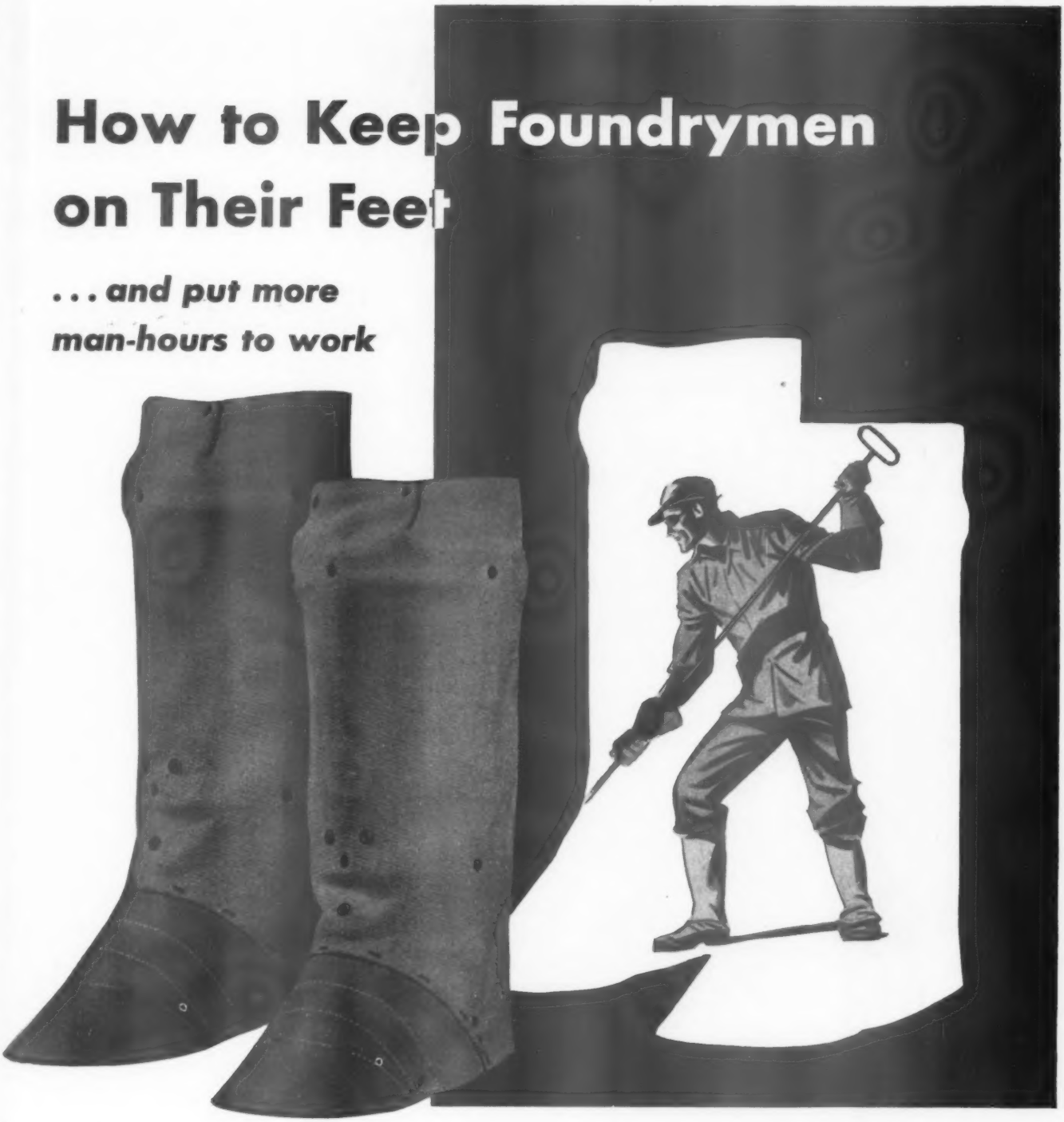
Every raise in wage rates or increased labor costs due to additional vacations with pay comes out of this 8.8 per cent, and there is no other possible conclusion. This scheme of requiring the use in the formula of labor costs prevailing on Feb. 1, 1942, to calculate selling price of castings now is simply a device to pull the industry back toward a 4 per cent profit basis. It is not surprising that the business man is, by and large, violently opposed to the New Deal.

The committee believes that the base period method of pricing castings, as provided for by MPR 244, should be discontinued, as it is working a hardship on some foundries; a hardship that will be even more in evidence in the future than in the past. An example of this is as follows: We had a buyer of gray iron castings come into our office last week with the request that we take on some business that was required to fill an Army contract. These castings had a high priority but we were behind on our orders of equally high priority, so we were unable to help. However, we made inquiries and I am pretty sure discovered the trouble. The recent supplier of these castings (which are also a civil-

(*Continued on page* 212)

How to Keep Foundrymen on Their Feet

. . . and put more man-hours to work



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READING HOISTS

(*Continued from page* 210)

ian requirement) had a frozen base period price which was entirely too low to result in anything but loss, and he simply failed to make delivery of any more of the required castings. I then looked up the rating of this recent supplier and saw at once that he was in no position to take any substantial losses.

But what about the delay to the Army in getting the equipment requiring these castings? In due course—no doubt—somebody will be found to make these castings on a formula price, but that will not bring back the lost time.

If the facts were available it would be found that most of the foundries in the higher profit brackets have managed to get rid of most of their customers patterns, the castings which would take a base period price.

Now that gray iron castings are critically short, this scheme is dangerous and the underlying cause should be removed, by discontinuing base period prices.

We believe that the formula method should be permitted in all cases. There is little doubt but that such an amendment will lead to higher prices for those castings which would be changed from base period price to formula method, but in the final analysis, I think the buyer will get such castings at a lower price than if the base period price is insisted upon.

Form Heavy Loss

The base period is from Aug. 1, 1941 and Feb. 1, 1942, and it is obvious that a considerable percentage of the castings made in that period were for civilian goods, the production of which was tapering off in that period. Many of these castings were sold at prices that had been established at the beginning of the year 1941 or before costs started to increase rapidly.

If the patterns for these castings have not been changed the castings would now have to be sold at the frozen price which in many cases would have been established early in 1941. This would incur a heavy loss to the foundry.

The argument that, "if the price was too low in the base period it should have been raised then, say in January, 1942" is not very convincing because nobody would normally bother about raising prices on an article that was going out of production.

As far as I can see the base period freeze in casting prices results in a shifting of patterns from a foundry that has made the job, has the flasks and equipment and would probably sell the castings at a lower price than the foundry to which the patterns were shifted. One large buyer of castings told me that he was astounded to find that according to some of his suppliers of castings, the change in a core box or a lug on a pattern was sufficient to make the casting substantially different from those previously made from the pattern, and thus avoid the base period price. Perhaps the gentleman was exaggerating, but it is one way of getting around the diffi-

(*Continued on page* 214)

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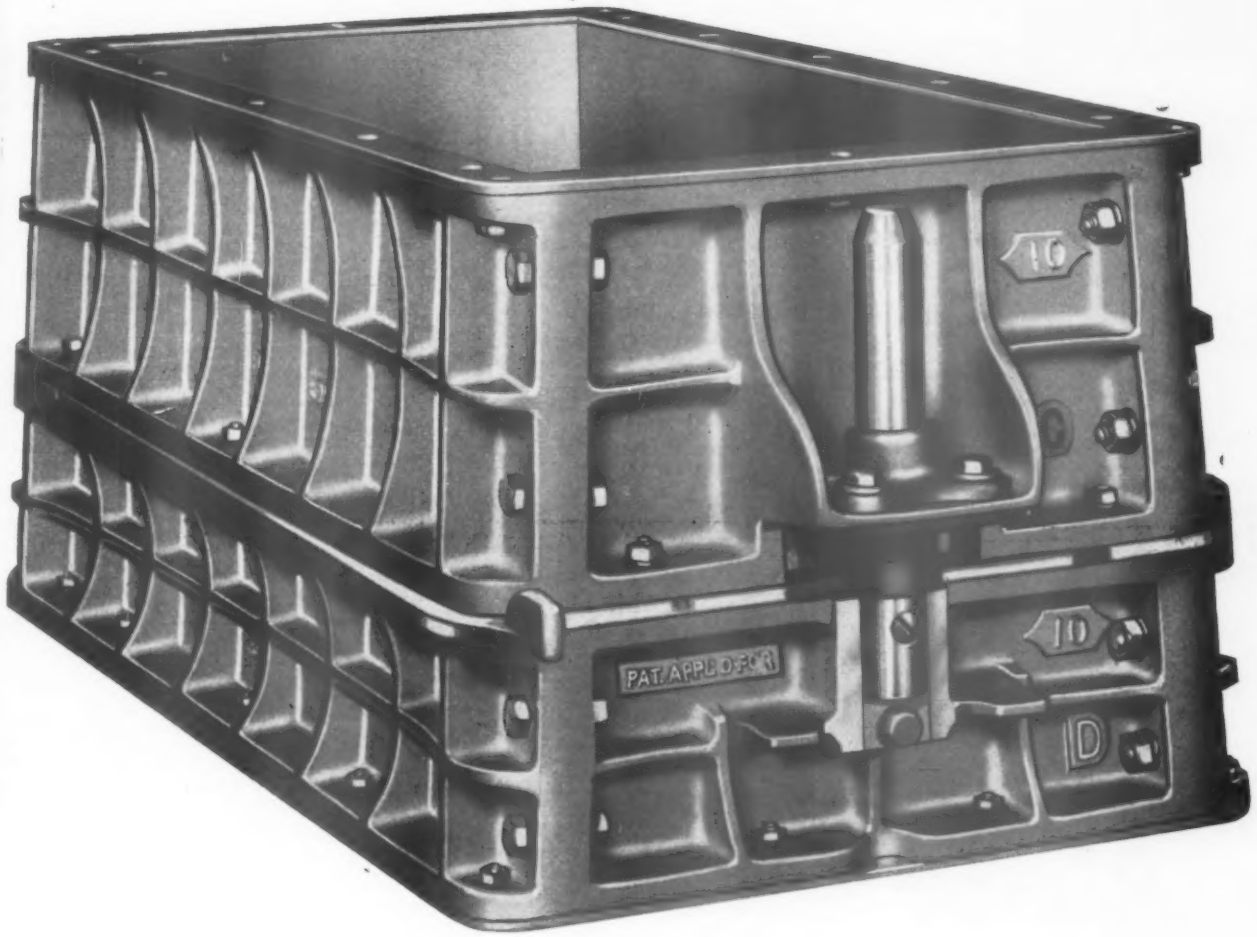

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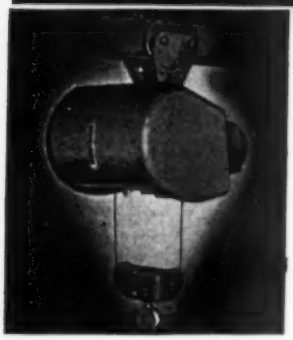

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(*Continued from page* 212)

culty, a difficulty which to my mind should not be permitted to exist.

We now come to the subject on which our committee has the greatest difference of opinion with the representatives of OPA, and that is the relief procedure. When a foundryman's costs have increased by causes beyond his control, such as increases in wage rates, to the point that he is losing money or not making a profit, he is expected to apply for "relief".

As you know, he may apply for "general relief" for all the orders in his shop or for specific relief on certain jobs or groups of jobs. An example of these increases in costs is the action of the WLB in the last few months of granting an extra week's vacation to all employes of over 5 years service in the Chicago area.

Until recently the policy of OPA in granting relief has been to permit a raise in selling price which would result in an estimated 4 per cent profit, both in cases of general and specific relief.

From a recent address by W. W. Welfling, chief, Gray Iron and Malleable Section, OPA, Washington, this policy now appears to be changed slightly, in that OPA now processes relief cases on the basis of 4 per cent profit or the average profit which the applicant earned in the so-called representative years 1936 to 1939 inclusive. However, I am afraid that this change may not mean very much because it is probable that many of the applicants for relief were among the lower profit brackets of the industry during those so-called representative years.

Production Not Normal

The 4 per cent profit is the average for the sample of 487 foundries for the years 1936-1939 inclusive which is shown on page 14 of the Statement of Considerations referred to previously.

In other words, it is the position of OPA that if a foundryman cannot make a profit under MPR 244, he may be permitted to increase his prices sufficiently to show an estimated profit of an amount which a sample of the industry showed as earnings for the representative period, which, as I have said before, is considered to be 1936-1939 inclusive. However, if this foundryman earned a higher average profit than 4 per cent in these representative years then he will be permitted this higher profit in his relief application. OPA is to be commended on this recent change in policy. I am afraid it will not help many of the applicants for relief.

Members of the Advisory Committee have objected strongly to this procedure on the following grounds:

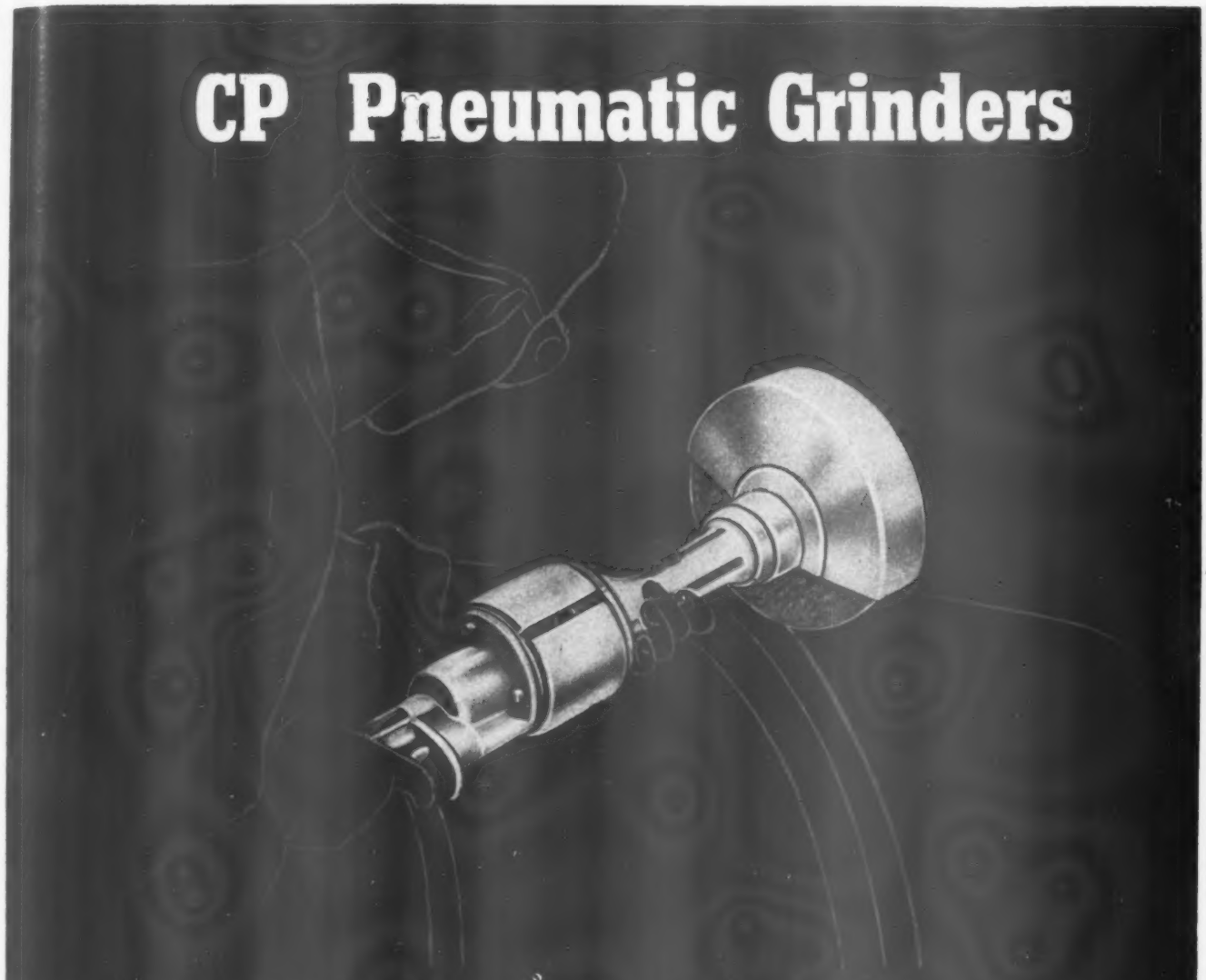
1. It is stabilizing prices by fixing profits at an unreasonably low level for a large part of the industry.

2. The sample of foundries selected by OPA is inadequate to represent the industry properly.

3. The representative period of 1936-1939 inclusive is unfair, because it is not a period of normal production of the in-

(*Continued on page* 216)

CP Pneumatic Grinders



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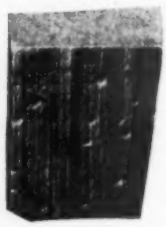

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(*Continued from page* 214)

dustry.

In examining these complaints we must bear in mind that after all, the primary purpose of OPA is to stabilize prices, not to see that each and every manufacturer earns a good profit. I imagine the only time OPA is concerned about the profit of an individual firm is when, in its opinion, there is a chance that the profit is too small to keep up maximum production. However, I am afraid that the policy makers of OPA have lost sight of the fact that when profits are kept unduly low the war effort of those plants with the unduly low profits will suffer.

How about the adequacy of the sample? Individual figures from any foundry are, very properly, not available to the members of the Advisory Committee, but we have examined the totals and the list of foundry companies that constituted this sample, and I am convinced that the job was done fairly, much as I dislike the way these figures are used. However, I question if any fair sample would show in these years an adequate average profit earned by our whole industry, on account of the semi-depressed condition of many of the producer goods industry.

The same remarks apply to the four representative years, 1936-1939, selected by OPA. It is quite apparent that any other four-year period between 1930 and 1935 inclusive would have been even more damaging, because I imagine those six years were the worst in the history of the industry.

Average Profit Poor

The committee just could not get away with the suggestion of substituting the years 1926-1929 as the base years. Even if OPA had agreed to this proposal in principle, I question if the necessary statistics would be obtainable for a period so long ago.

As far as I know it has always been the custom of the industry to price estimates on a minimum of 10 per cent profit on sales, except in rather special cases. This is after making a suitable allowance for defectives. Just what is the matter then? Why has the industry made such a poor average profit showing in the 11 years prior to 1941?

To answer that question we will turn to the shipments of foundry pig iron for the entire country.

It is true that all of this foundry pig is not used by our industry, but the percentage is probably about the same for all years in question. Taking these shipments of foundry pig as 100 per cent for the average for the years 1926-1929 we find that the average for the years 1936-1939 is represented by only 48 per cent. In other words, there was just about half as much foundry pig shipped in the so-called representative years 1936-1939 as in the four-year period 1926-1929. At any rate, I think from these pig iron figures we can conclude that our industry had not recovered from the depression by the time defense orders started coming into the market.

Generally speaking, the monthly net profits as a per cent of sales of the jobbing type of gray iron foundry drops off 10 per cent for about every 4 per cent drop in monthly production from "normal" (or the losses increase by that amount) provided that the average selling price and class of castings have not changed.

The reverse also is true for an increase in production. Obviously this contemplates a "break even" point at about 60 per cent of normal production. If any are lucky enough to have a "break even" point of 50 per cent of normal production then profits as a per cent of sales will decrease 10 per cent for every 5 per cent drop in monthly production from normal.

How does this work? Assume that a foundry has an average selling price resulting in a "break even" point of 60 per cent of normal production which is 150 tons per month, and that for another month the production falls off by 20 per cent from normal, or to 120 tons per month, and that during these two months the average selling price or kind of castings produced do not change.

Let us further assume that this foundry's per cent of profit on sales when operating at normal capacity was somewhat below that as shown at present by the sample of the industry as used by OPA or say, 6 per cent.

Decrease Doubles

The decrease in the per cent of profit on sales when the monthly production drops 20 per cent with no change in selling price or class of castings, would be twenty fourths times ten or 50 per cent. Thus the profit for this month of 120 tons production would be only 3 per cent on sales.

Now when we look back at the foundry pig iron figures quoted previously, it can be understood why the gray iron industry in the years 1936-1939 earned such a small profit.

One of the characteristics of jobbing foundries—possibly the entire gray iron foundry industry—is the sharp variations of monthly production. Jobbing foundrymen will find in looking over their record of monthly production for a period of years prior to the war, and even prior to the depression, that production varied from about 22 per cent below to 40 per cent above the average monthly production for the year. As an example:

A foundry which before the war had an average production for say, 1939, of 200 tons could be reasonably expected to find that in one month of that year the production reached a high of 280 tons and had a low of 150 tons. In my opinion this is not at all extreme—surprising as it may sound.

It is true that variations in monthly tonnage by gray iron foundries during 1941, 1942 and 1943 have not been as great as those prevailing before the war, but recent statistics show production of gray iron castings in the United States dropped from April, 1943 to July, 1943

(*Concluded on page* 218)

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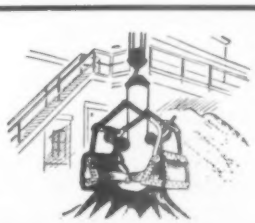

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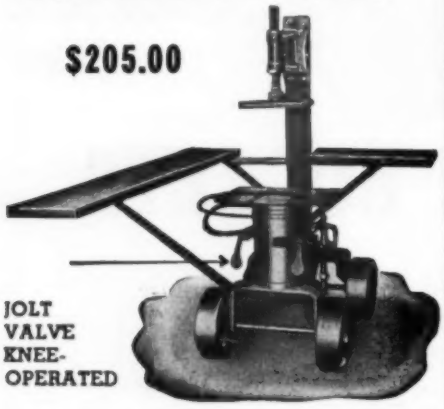

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(*Concluded from page 216*)

by 16 per cent. Thus it is obvious that some foundries must have had a very sharp drop in production between those two months.

This variation of monthly tonnage is important when anyone starts talking about profits as low as 4 per cent. When we consider that about 4 per cent change in monthly production affects profits or losses by 10 per cent, I do not understand how OPA or anybody else can predict those profits as close as 4 per cent.

You may have noticed that when discussing the "relief" procedure I said that OPA processed these applications allowing an *estimated* 4 per cent profit. If the foundry continues to handle the same class of castings it only takes a drop of less than 2 per cent in monthly production to wipe out this estimated 4 per cent profit and cause a loss. This was not so serious when volume was increasing or holding up, as in 1942 and part of 1943, but as a result of the shortage of manpower production seems to be starting to decline, and thus 4 per cent "relief" is useless.

Short running jobs that would have a selling price under MPR 244 showing no profit also present a problem under the "relief" procedure of OPA.

OPA has not the personnel to process relief cases at once. In fact, there is considerable complaint at the length of time taken to complete some of these relief cases.

Difficult To Sell

What is to be done about orders that show a loss but are completed and shipped before any relief could be granted? Supplementary invoices are pretty difficult to sell to the customer and in some cases the customer cannot tolerate them.

We are hearing a good deal lately about gray iron castings being short for defense purposes and, as a result, hindering the war effort. If this is the case—and I have no doubt but that it is—then I think that the policy makers of OPA are in a considerable measure responsible. It is all very well for OPA to say that the average profits as shown by their sample for the third quarter of 1943 is, say, 8 per cent on sales before tax. Obviously if this is an average, half of the industry is earning less than this. And it is equally obvious that the castings which are made or should be made by this lower profit group might well be just as necessary to the war effort as those made by the higher profit brackets.

It is my opinion that any foundryman earning less than 8 per cent before tax simply cannot afford to keep his plant and equipment in shape to turn out maximum production, even with the labor available.

An an example: One of my foundry friends recently was complaining about the shortage of common labor in his plant and I suggested he purchase a gasoline driven industrial truck. They cost about $2000, but are great labor savers. He wanted to know who was going to pay for it. From what he told me about his profits after tax he certainly could not readily make any expenditure of that kind—particularly in view of the fact that some of his present equipment was worn out and needed replacement.

This acceleration of depreciation of equipment that has been going on in our foundries for the last 3 years should be given consideration by OPA in considering profit margins. Foundry equipment has been operated longer hours at greater loads and with inadequate maintenance in this period, and in many cases some replacement is now urgent, but 4 per cent profit before tax will not go very far in this direction.

In fairness to the policy makers of OPA I do not want to give the impression that the critical shortage of gray iron castings, which now appears to exist, is entirely, or even in a large degree, their fault. However, I do believe—and that conviction has grown much stronger in the last month—that the policy of restricting profits to an unreasonably low figure, should have some portion of the blame for this critical shortage.

This matter is serious and needs immediate action. I believe that OPA must change its policy as regards profits.

Those foundries that are earning substantial profits obviously do not need higher prices, but for a large number of units of the industry this condition does not prevail.

I feel that OPA should revise its whole "relief" procedure—make it speedier, simpler and above all, more realistic as to the needs of the applicant.

In these remarks I have been critical of the OPA, but I would like to say that my criticism has not been directed against the staff of the Iron & Steel Branch, with whom we have been dealing, but rather against the policy makers of this organization, who, I believe, have been laying too much stress on stabilizing prices and not enough on permitting many foundries to earn sufficient profit to maintain and equip their plants for a high rate of production.

The staff of the Iron and Steel Branch which has been meeting with our committee has been extremely courteous and patient in the many arguments we have had with them and I would like to take this opportunity of thanking them.

Production of Steel Castings Up

Production of steel castings in May totaled 161,783 tons, against 155,778 in April and 163,812 a year ago, according to reports to the Department of Commerce by a majority of producers. Orders booked, less cancellations, totaled 176,993 tons in May, compared with 175,053 in April and 192,531 a year ago.

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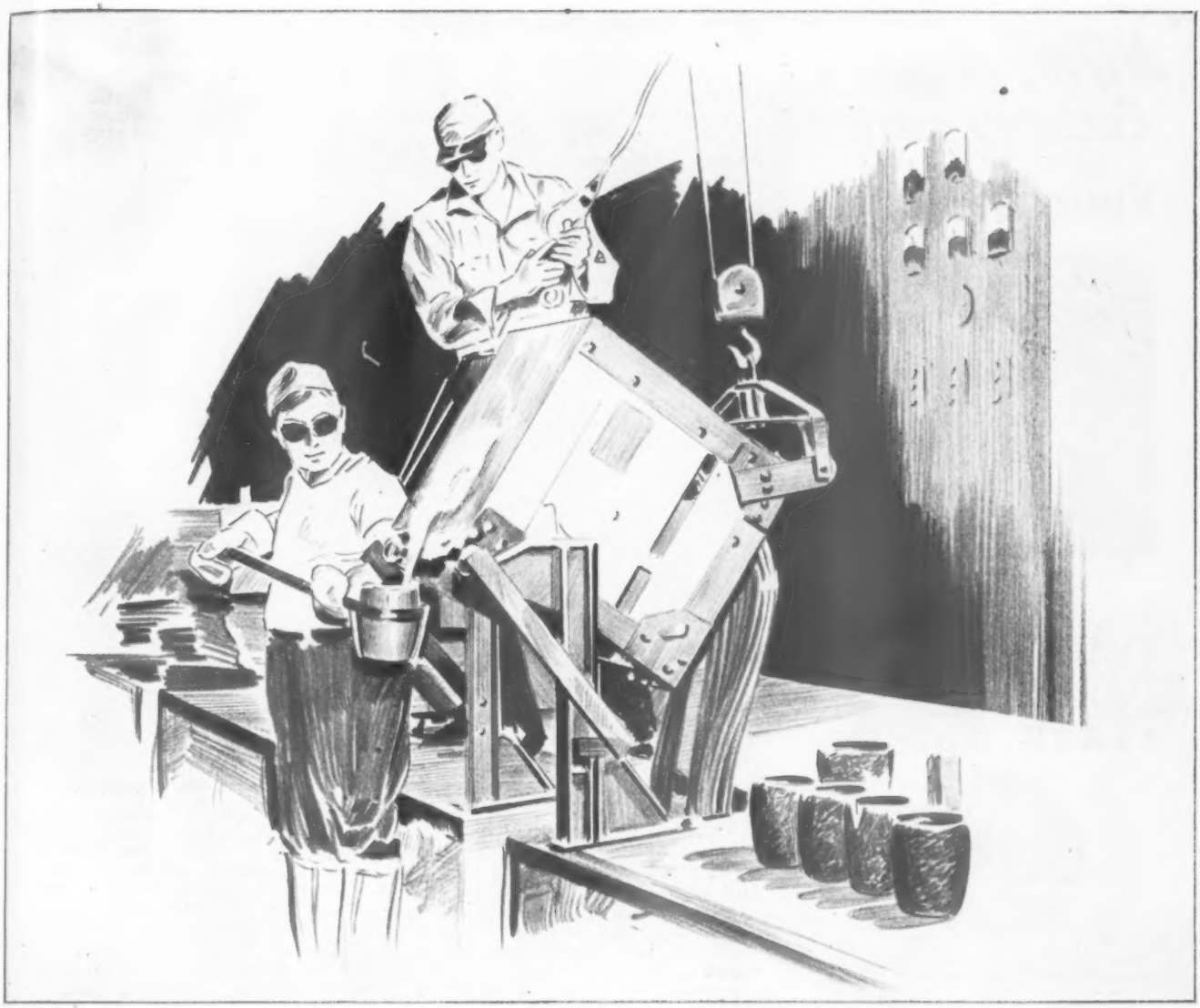

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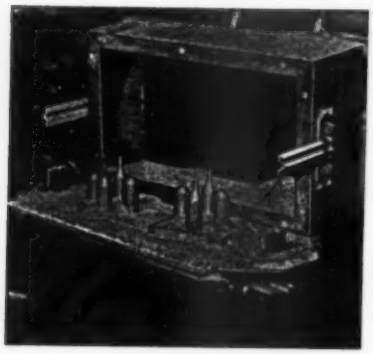

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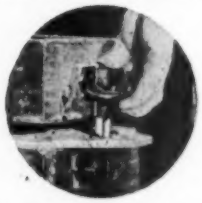

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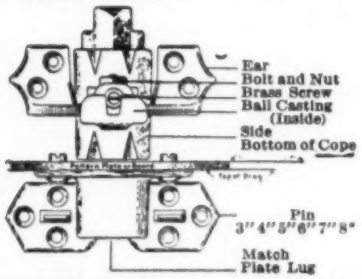

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NEW TRADE PUBLICATIONS

TEMPERATURE CONTROL—Leeds & Northrup Co., Philadelphia 44, recently published bulletin N-33B-643(1) entitled "Limiting the Temperature of Open Hearth Roofs" which describes application of its equipment for that purpose.

IDLER—A 16-page illustrated book, No. 1915, available through Link-Belt Co., 307 N. Michigan Ave., Chicago, announces a new belt anti-friction idler for belt conveyors, and gives detailed information on various sizes and types, including troughed carrying-run, flat-roll carrying and return, troughed self-aligning, and self-aligning return idlers. Dimensions, weights and list prices are shown.

SAND CONDITIONING — Royer Foundry & Machine Co., Kingston, Pa., has issued a 32-page bulletin, No. 744, describing its sand conditioning equipment, from the portable, "Royer, Jr." to the massive stationary Model "R", capable of handling from 40 to 50 tons of sand per hour. Also shown are combination sand conditioning and scrap remover units for large steel jobbing foundries.

V-BELTS—B6331, a new quick-picture bulletin released by Allis-Chalmers Mfg. Co., Milwaukee 1, describes each of the various V-belts, sheaves and drives developed by that company.

STEEL FLOORING—A 24-page book of complete information on open steel grating and stair treads issued by Wm. F. Klemp Co., 6601 S. Melvina Ave., Chicago 38, provides full installation data for plant and building uses.

GRINDING WHEELS—A folder issued by Norton Co., Worcester 6, Mass., gives specification numbers of grinding wheels that have attained outstanding popularity for grinding steel and annealed malleable castings.

PURIFIER — Pittsburgh Plate Glass Co., Columbia Chemical Div., Grant Bldg., Pittsburgh 19, has issued a 4-page pamphlet covering the extensive use of Columbia soda briquettes and Hennig purifier to be used in the reduction of sulphur in iron and production of cleaner, denser steel.

LUBRICATION — Bulletin No. 25, published by the Farval Corp., 3295 E. 80th St., Cleveland 4, describes how centralized lubrication systems increase the production output of machinery and make impressive savings in time, power and lubricating materials.

POSITION WELDING—Bulletin No. 2112, released by Ransome Machine Co., Dunellen, N. J., treats the many advantages of proper positioning for welding, and explains the use of positioning equipment.

CASTINGS—Illustrations of comparative castings and welded fabrications for the same parts on Diesel engines and heavy-duty press construction are shown in Bulletin No. 19, entitled "Meehanite Castings vs. Welded Construction," published by Meehanite Research Institute of America Inc., Pershing Sq. Bldg., New Rochelle, N. Y.

OXYACETYLENE—"New and Improved Oxyacetylene Methods for Steel Foundries," published by Air Reduction, 60 E. 42nd St., New York 17, describes performance of common steel foundry operations by the use of oxyacetylene flame. Removal of risers by machine flame cutting and various other processes are treated in the booklet.

FURNACES—Hevi Duty Electric Co., Milwaukee, has issued Bulletin HD-644, covering car bottom furnaces and their uses. Bulletin HD-744 describes a convection tempering furnace designed for tempering small work for production or tool rooms.

LATHES—Catalog No. 150, issued by South Bend Lathe Works, South Bend 22, Ind., describes and illustrates lathes for practically all types of production, toolroom and maintenance work.

REPAIR OF VALVE CHIPPERS—Ingersoll-Rand Co., 11 Broadway, 4, N. Y., offers a wall chart, metal bound, graphically illustrating with a cross-section view of parts, proper maintenance of its chipping hammers.

WATER COOLING — Marley Co. Inc., Kansas City, Kans., has published a 32-page bulletin, No. 806, entitled "Fundamentals of Water Cooling," which explains all phases of the subject in a condensed but thorough treatment. A "refresher course" for engineers and a practical working reference for non-technical men, it brings the reader abreast of latest trends in the field.

CONVEYOR—A conveyor designed to carry loads on 6" centers with a maximum loading capacity of 125 pounds per foot is described in a new 36-page booklet published by Richards-Wilcox Mfg. Co., Aurora, Ill. The booklet contains photographs of actual plant installations showing the extreme adaptability of the equipment.

CERIUM ALLOYS—Cerium Metals Corp., 522 Fifth Ave., New York 18, has issued a pamphlet containing basic facts about cerium, urging makers of new alloys, compounds and products to seriously consider the unique properties of this metal.

OIL RECLAIMER — Youngstown Miller Co., Sandusky, O., is offering Bulletin YM-700 covering its new robot oil reclaimer. The units are capable of restoring all kinds of lubricating, hydraulic, cutting and vacuum pump oils so that reclaimed oil can be re-used in the same manner and place as the new oil.

COOLING EQUIPMENT — Coppus Engineering Corp., Worcester, Mass., has issued a new bulletin 160-6, on recent designs of man-cooling equipment. Two types of fans are described, one providing moderate volumes of air at high velocities, the other moving large volumes and adaptable to large areas.

MEASURING INSTRUMENTS — Illinois Testing Laboratories, Inc., 420 N. LaSalle St., Chicago 10, has issued Bulletin No. 2929 describing temperature and air velocity measuring instruments designed to withstand foundry operating conditions and to provide accurate measurements for efficiency production.

ACCUMULATORS—An attractive, illustrated pamphlet offered by Greer Products Corp., 39 W. 60th St., New York 23, describes the adaptation of hydraulic accumulators for many types of portable and stationary equipment.

FURNACES — Surface Combustion Co., Toledo, O., offers a 4-page circular covering applied gas chemistry of prepared atmospheres in furnaces. Composition, reaction and application charts are shown as sidelights on furnace engineering.

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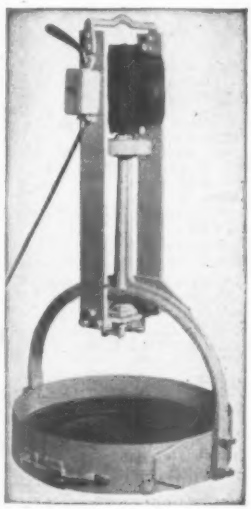

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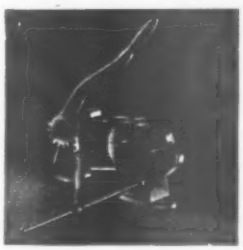

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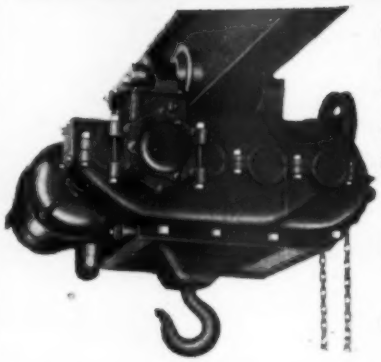

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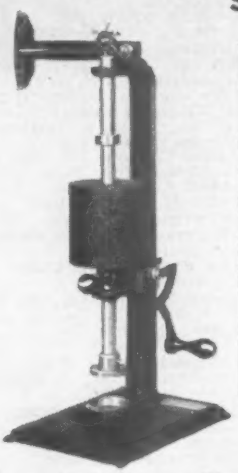

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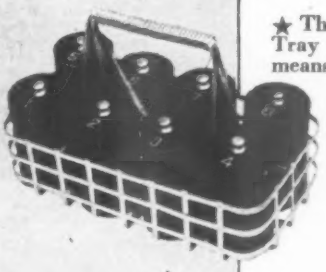

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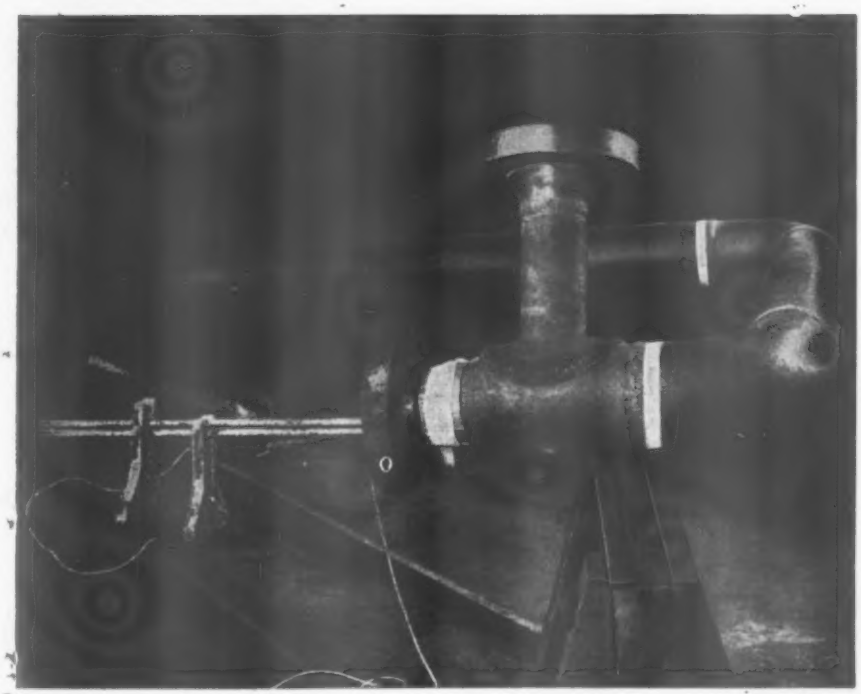

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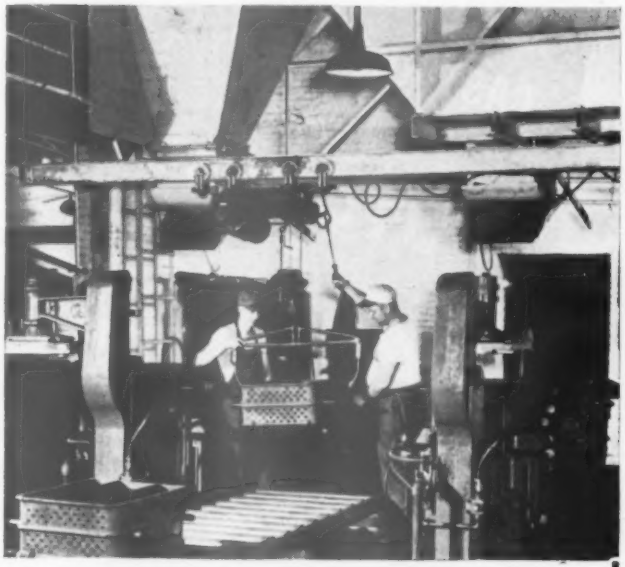

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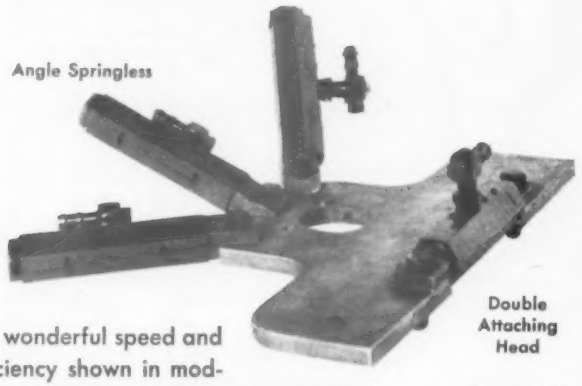

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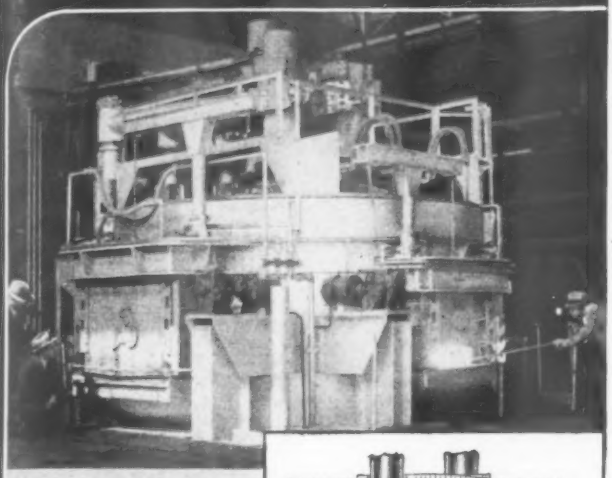

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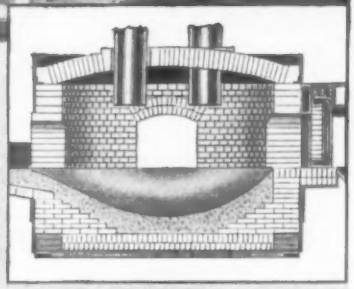

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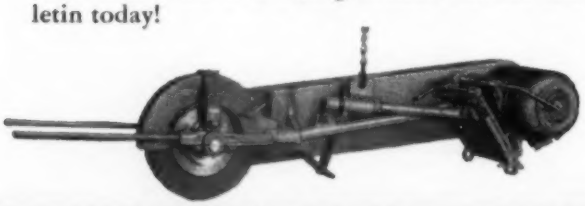

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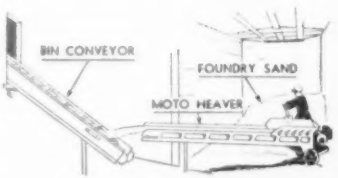

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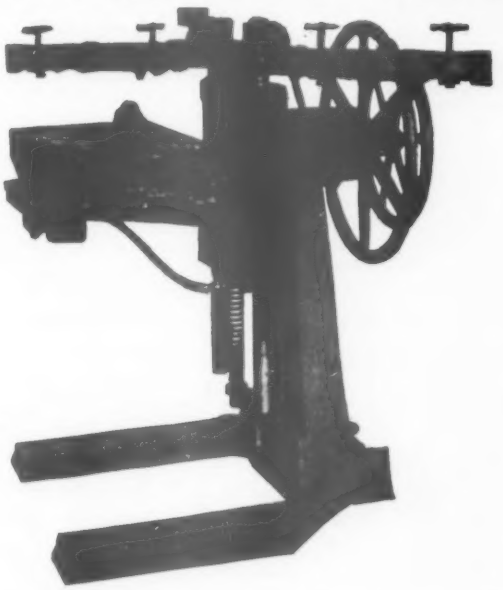

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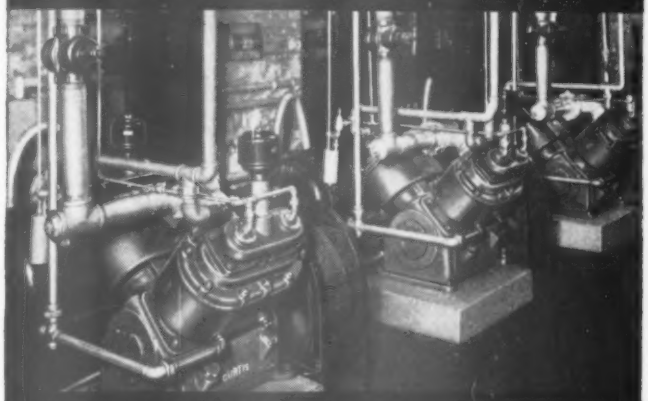

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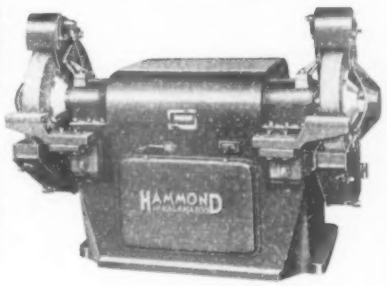

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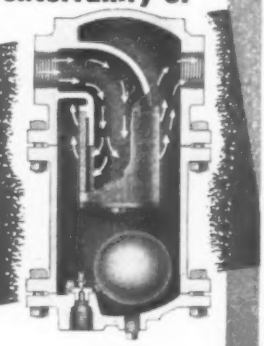

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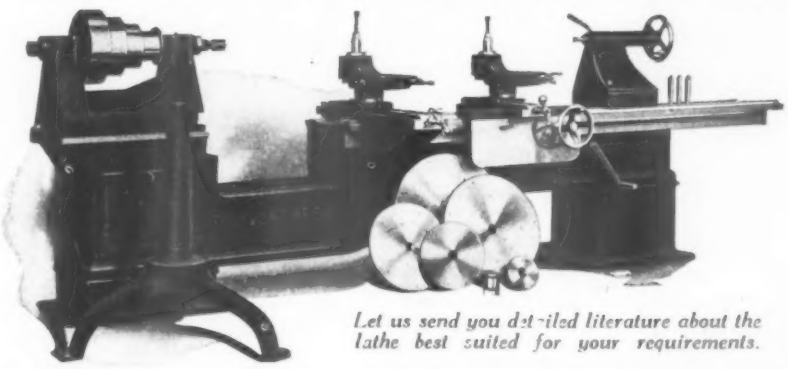

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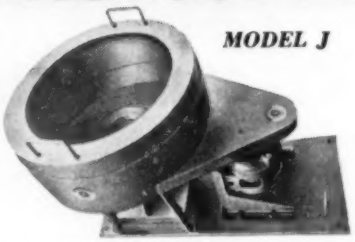

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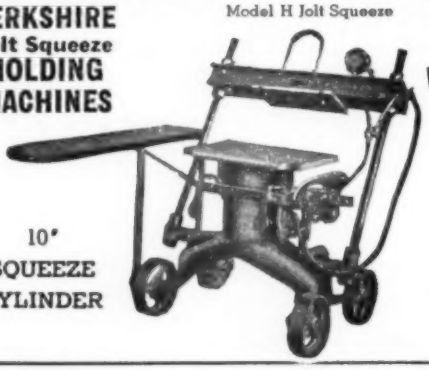

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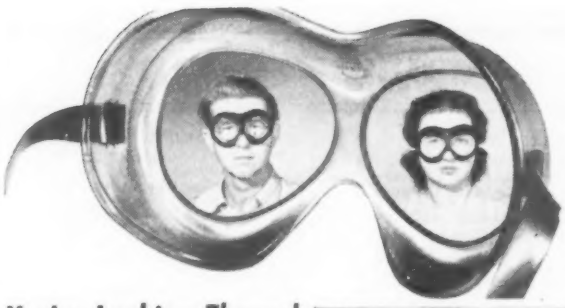

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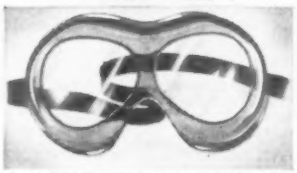

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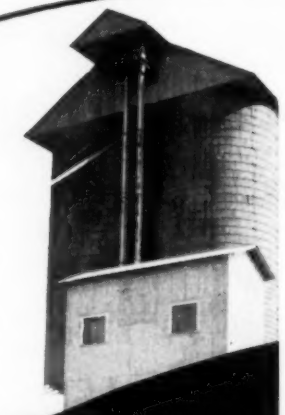

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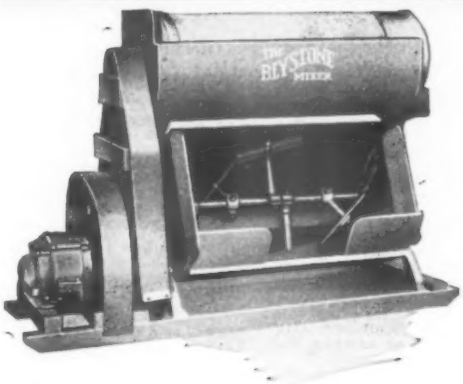

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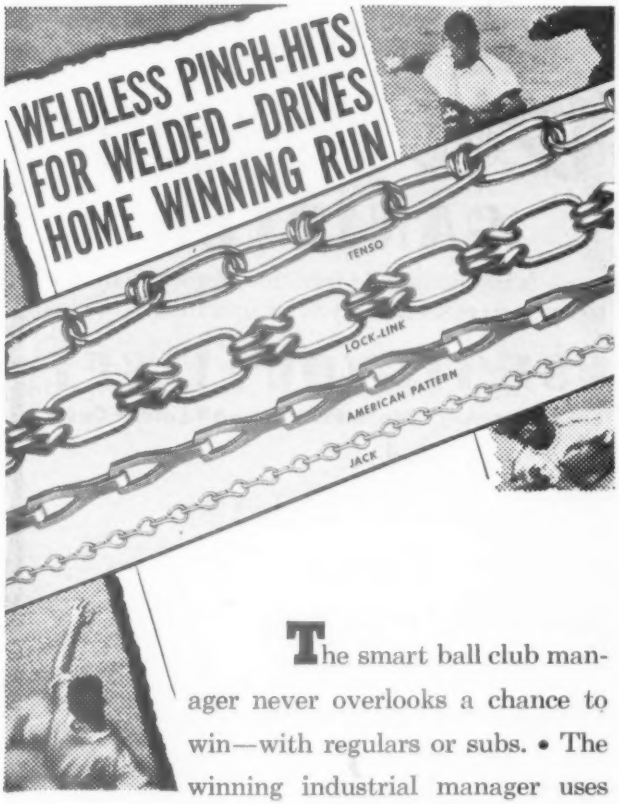

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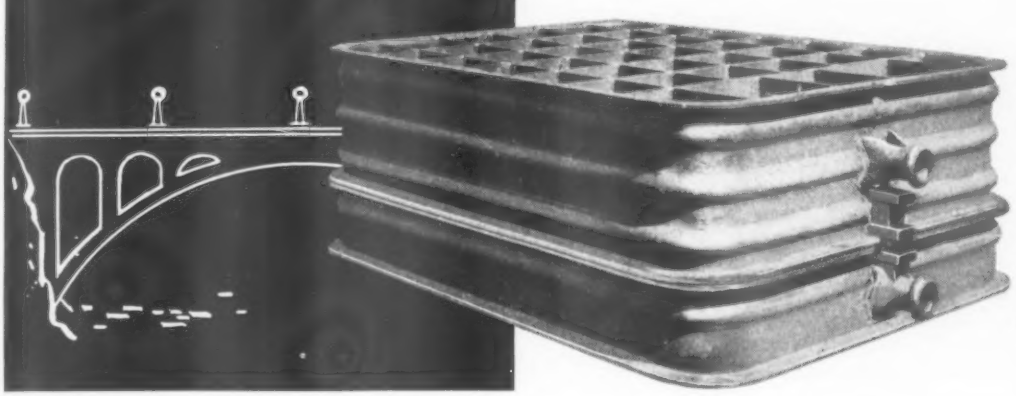

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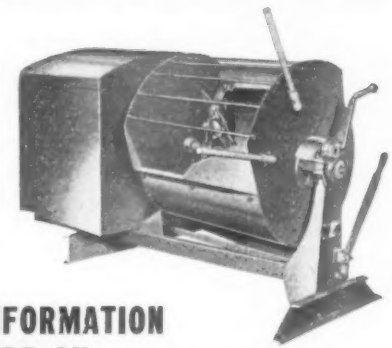

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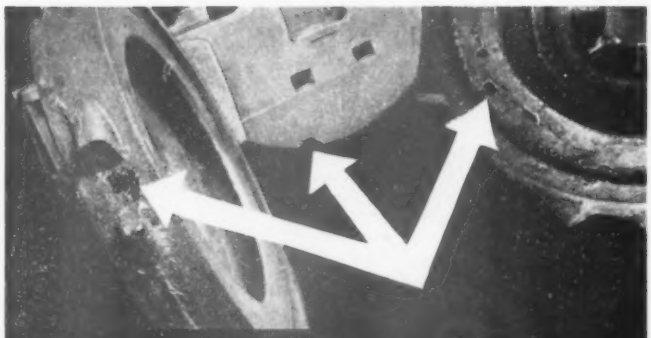

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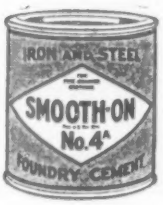

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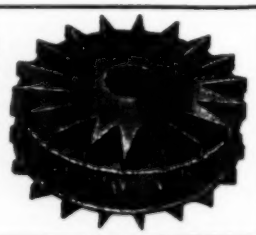

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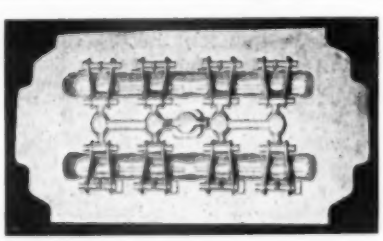

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With 25 years' practical experience producing heavy and light casting in green and dry sand and loam. Technically trained. Can produce high tensile iron. Well versed in continuous pouring. Address: Box 608, The FOUNDRY, Cleveland 13, Ohio.

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Wants charge of gray iron jobbing shop running 25 to 30 tons per day. Twenty-five years' experience on green and dry sand. Heavy and light work on floor and sandslinger. Capable of taking complete charge. Address: Box 616, The FOUNDRY, Cleveland 13, Ohio.

Classified Advertising

Employment Service

SALARIED POSITIONS

This advertising service of 34 years' recognized standing negotiates for high salaried supervisory, technical and executive positions. Procedure will be individualized to your personal requirements and will not conflict with Manpower Commission. Retaining fee protected by refund provision. Identity covered and present position protected. Send for details.

R. W. BIXBY INC.
101 Delward Bldg. Buffalo, N. Y.

GRAY IRON FOUNDRY EMPLOYMENT

We are receiving many inquiries for superintendents, metallurgists and foremen. We shall be glad to hear from qualified men. No charge.

Gray Iron Founders' Society Inc.
1010 Public Square Building Cleveland, Ohio

Foundries For Sale

FOUNDRY-MACHINE SHOP BUFFALO AREA

Same owner 30 years; sales $70,000 year; marine-mfg. and sub government contracts; excellent post war product; 2 buildings 32 x 119—64 x 130; fully equipped; excellent condition, very profitable; $60,000; terms.

FOUNDRY IRON CLEVELAND AREA

Sales $500,000 year; est. 20 years employ 70; modern equipped; 4 bldgs.; 50,000 sq. ft.; settle estate $135,000 or sell control.

THE APPLE COMPANY
BROKERS EST. 1905 CLEVELAND, OHIO

NONFERROUS FOUNDRY FOR SALE

Well located in Chicago. Now employing twenty men doing $25,000 monthly business. Expansion possible. 12800 square feet.

BOX 598

The FOUNDRY CLEVELAND 13, OHIO

GRAY IRON FOUNDRY FOR SALE

In Southern Michigan. Now running and showing good profit. Less than 100 miles from Detroit. Will sell for $30,000. Address: Box 594, The FOUNDRY, Cleveland 13, Ohio.

FOR SALE

Gray Iron Foundry and well equipped Machine Shop, operating over fifty years. Centrally located in city of 30,000 population in New York State, capacity 100 employes, railroad siding. Plant in running condition. Price reasonable. Address: Box 563, The FOUNDRY, Cleveland 13, Ohio.

Wanted-To-Buy

MIXERS WANTED

Used Simpson Intensive Sand Mixers. State size, condition and lowest cash price for immediate acceptance. Address Box 578, The FOUNDRY, Cleveland 13, Ohio.

MALLEABLE OR GRAY IRON FOUNDRY

Small foundry in the East wanted. Will consider whether operating or not. Address: Box 589, The FOUNDRY, Cleveland 13, Ohio.

WANTED

Core knockout machine—one capable of handling transmission cases or cylinder blocks—pneumatic type—must be in working condition. Address: Box 587, The FOUNDRY, Cleveland 13, Ohio.

WANTED TO BUY OR LEASE

Foundry suitable for nonferrous castings in Chicago or Milwaukee areas approximately 25,000 sq. ft. on siding. Give full details in first letter. Address: Box 582, The FOUNDRY, Cleveland 13, Ohio.

For Sale

SECOND-HAND COAL OR COKE CONVEYOR

Wanted to move material about fifty feet from railroad car to foundry. Address Box 596, The FOUNDRY, Cleveland 13, Ohio.

WANTED

Used Tabor-Abrasive Cut-off Machine, Type C 7½F or C 10 AF, with 220 Volt, 3 phase motor. Address: Box 570, The FOUNDRY, Cleveland 13, Ohio.

WANTED

New or second hand moulding machine, one pin lift and one rollover portable jolt squeeze, table size minimum 19 by 23 inches, pattern draw not less than four inches or equal. Address: Box 599, The FOUNDRY, Cleveland 13, Ohio.

Opportunities

SPECIALIZING IN REPAIRING AND REBUILDING BRICK FOUNDRY OVENS AND FURNACES. THIRTY YEARS' EXPERIENCE WITH NATIONALLY KNOWN OVEN COMPANY. ADDRESS: HARRY WESTHEAD, 3281 KILDARE RD., CLEVELAND HEIGHTS 18, OHIO or PHONE YE 4061.

For Sale

AIR COMPRESSORS

BELTED—176 ft., 355 ft., 540 ft., 676 ft., 752 ft. & 1300 ft.
ELECTRIC—355 ft., 528 ft., 676 ft., 807 ft., 1302 ft., 1723 ft., 2022 ft., 2200 ft., 2800 ft., 3600 ft., & 5000 ft.

STEEL TANKS

9—5000 gal., 11,500 and 18,000 gal. cap.
17—1000 bbl., 4000 bbl. and 10,000 bbl. cap.

TANKS BOUGHT AND SOLD
R. C. STANHOPE, INC.
60 East 42nd St. New York, N. Y.

FOR SALE

Milwaukee Jolt Pin Lift Molding Machine. Practically new, 1500 lbs. capacity; piston diameter 8"; pattern draw maximum 12"; jolt table width 32"; length 38"; lift pin centers width min. 25"; lift pin centers width max. 36"; length, minimum 27"; length maximum 38". Immediately available. Write or call at once. **Brillion Iron Works, Inc., Brillion, Wisconsin.**

FOR SALE

1 Simplicity 4 x 6 Model "B" Shake-out; capacity 5000 lbs.; installed May, 1937; used in small tonnage foundry on small works; replaced by larger size. Has new eccentric shaft and shaft bearings. Needs rubbers and top wearing strip renewed. In first-class useable condition. Immediate delivery. Make offer f.o.b. St. Louis. **STERLING STEEL CASTING CO., P. O. BOX 66, EAST ST. LOUIS, ILL.**

FOR SALE

Molding Machines, 3, for sale—Hand Squeeze Tabor make. New. Forest Hill Foundry Co., 95 Tiffany Blvd., Newark, N. J. Make offer.

FOR SALE

2—25 TON WHITING CUPOLAS

-:-

CRANES and HOISTS
N. B. PAYNE & CO., INC.
105 W. 55th Street New York 19, N. Y.
Telephone Circle 7-6730

FOR SALE

Tyler hummer electric screen unit—4 ft. by 5 ft. ton capacity, top screen; 60 mesh stainless steel bottom screen. Complete with screens, vibrator and motor generator. Ready for operation. Address: Box 494, The FOUNDRY, Cleveland 13, Ohio.

FOR SALE

One (1) Type GD-1 Size 3 Pangborn Barrel Sand Blast. In good operating condition.
Price $450.00
as is, f.o.b. Burlington, Iowa. Address: Murray Iron Works Company, Burlington, Iowa.

For Sale

SPECIAL VICTORY BARGAINS

Cast Iron and Steel Plate Mill-Dust & Shavings Exhausters 50 in stock. **Cupola and Furnace** Blowers for Coke, Oil or Gas Combustion.
1—Spencer Blower 2250 C.F.M.—1½ lbs.—25 H.P. 3/60/220 or 440 AC.
2—Sprague 4 Ton Electric Hoists 115 V. D.C.

MELTING FURNACES

2—Walker-York coke fired crucible furnaces for up to No. 80 crucibles—blowers attached.
1—US Rotary No. 3—Melting or Smelting.
1—Pair Monarch-Rockwell's—Rotating, each 500 lbs. cap. mounted together on base, oil burners available, when used together waste heat from one preheats other.
1—Hausfeld open flame, non crucible 400 lbs. brass capacity or equivalent volume for Aluminum.
1—Stationary for No. 70 crucible.
1—Schwartz, size 42" class A—for oil fuel.
Tumbling Mills—1 cast iron for brass cleaning.
1—Sly 48" x 60"—1" thick round steel shell.
Core Ovens: Small portable.
1—Jeffrey Sand Conditioner, portable 2 HP, volts 220-440.
1—Blystone—7 cu. ft. capacity size, belt driven mixer.
Molding Machines:
1—Battenfeld stationary 12" cyl., plain squeeze.
1—Arcade portable plain air squeeze.
1—Osborn No. 405 stationary jolt-rollover draw.
1—International 26" x 36" type F jolt-rollover-draw.
2—Johnston & Jennings Portable jolt-rollover-draw 24" x 30" tables.
1—Tabor all hand operated Portable 24" x 36" rollover, 8" draw.
1—Osborn No. 75-J portable, 10" squeeze, 3" jolt.
1—Tabor Portable 14" x 20" table, Rollover draw hand operated.
1—Tabor Stationary 14" x 16" table, Rollover Draw hand operated.
Compressors:
Bury—12" x 10" modern valves—358' cap. 100 lbs.
1—Chicago 12" x 8" 240' cap., 70 lbs.
Gardner 4½" x 4½" Vertical 19'.
Tested-air receivers—12" up to 36" dia.

CLIFTON MACHINERY CO.
1023 W. 6TH, CINCINNATI 3, OHIO

FOR SALE

Despatch Drawer Type Core Oven; 4 trays, 8" high, 36" wide, 6 ft. long; 1 tray 16" high, 36" wide, 6 ft. long; Overall dimensions 7½ ft. high by 4½ wide by 7 ft. long; Equipped for Butane Gas at present.

1½ Hsp. Type M 7A Strand Flexible Shaft Grinder; 8 by 1½ by ¾ Wheels; High Speeds 2500-3500-4500 RPM; 220 V, 3 Phase, 60 Cyl. AC; Mounted on 4 wheel Truck and Swivel Base with all standard attachments Like New.

2 Johnston Pressure Blowers with Motors:

(a) Size No-510 Blower with 5 Hsp. Motor, Capacity 1250 CFM 10 oz. Pressure.

(b) Size No-112 Blower with 1½ Hsp. Motor, Capacity 200 CFM, 12 oz. Pressure.

Whiting "EZ-Pour" Crane Ladle; 23" top Diameter.

Lewis No. 7 Core Wire Straightener & Cutter Machine with GE ½ Hsp. Motor, 345 RPM, 60 cy, Capacity Up to ¼" diameter wire 1" to 12" 220 Volt, 3 Phase; Height Over all 18¼"; long; Speed 80-6" pcs. per minute; Operate by hand or by motor.

Adams Cherry Easy Lift Off Wood Flask; Size 14 by 14 with 8½" cope, 3" Drag, 4° Taper. One ¾" Round Pin and One ¾" Hex Pin with bushing pin centers 17¾".

Nine 14" by 14" by 9" deep Cast Iron Jackets, 4° Taper; Jackets extend 1¾" on Drag, 7¼" on Cope.

Whiting Wishbone Charger & Buckets.

Modern 400" Cylindrical Ladles with Cover.

PAUL PUFAHL & SON FOUNDRY
COMO AVENUE, S. E., and CITY LIMITS
MINNEAPOLIS 14 MINN.

FOR SALE

Ruemelin Room Type Sand-Blast 10' x 10' x 8' with overhead Track and Bottom Track with Heavy Duty Track car. 10 cubic feet Blast generator with complete Blast material conveyor. No. 19 Clarage Exhaust fan. Unit practically new. Set up ready for operation. For further details contact **THE UCHTORFF COMPANY, 201 N. HOWELL STREET, DAVENPORT, IOWA.**

Classified Advertising

For Sale

FOR SALE

Wilbraham-Green Rotary Cupola Blower, Model No. 7A, single geared, silent chain drive with 60 H.P. G.E. motor, 60 cycle, 685 R.P.M.

BLOWER CAPACITY

Displacement per revolution—55 cu. ft.

Delivers 10,500 cu. ft. of air per minute at 1 lb. of blast pressure at 56 H.P.

Production output for above characteristic—18 to 21 tons of iron per hour in a cupola 72" inside lining diameter.

Weight without motor—16,750 lbs.

Suitable for foundry as well as for tunnel ventilation, also in mining and smelting, in chemical process industries, oil refining, etc.

Above equipment was in active use for about one year only.

For further information write to

CHAS. F. GUYON, Inc.

WAREHOUSE

190 WHITON ST.

JERSEY CITY 4, N. J.

or call

BERGEN 4—7300

REBUILT USED EQUIPMENT

Molding machines, all types; tumbling mills; furnaces; cupolas; air compressors; hoists; rammers, all types; ladles, all types; sand mixers, sand blast tanks; core machines, etc. All equipment rebuilt and guaranteed. All sizes used steel flasks.

HAYNES FOUNDRY EQUIPMENT COMPANY
1734 Lake St. Kalamazoo 21, Mich.

FOR SALE

1—J. C. Bush Sprue Cutter.
Size—Jaw Opening ..... 2"
Cutters ..... 3½"
Elevating Table ..... 4"

ST. LOUIS STEEL CASTING COMPANY
100 MOTT STREET ST. LOUIS, MO.

REBUILT
BLOWERS—FANS—EXHAUSTERS

Roots-Connersville positive cupola blowers. Centrifugal blowers for gas and oil burning. Sand blast, grinder end dust exhausters. Ventilating fans.

GENERAL BLOWER COMPANY
404 N. Peoria St. Chicago, Ill.

FOR SALE

1 No. 91 and 1 No. 92 Osborn Core Blowers Good Condition. $1000.00 takes both machines. Address: Box 605, The FOUNDRY, Cleveland 13, Ohio.

FOR SALE

1 34" diameter x 74" long rebuilt Whiting Exhaust Tumbler, with renewable trunnions, door opening entire length of barrel. ADDRESS: BARNETT FOUNDRY & MACHINE CO., LYONS AVE. AND COIT ST., IRVINGTON, N. J.

INDUSTRIAL MELTING FURNACE

1—No. 150/225 Tilting Crucible Coke Furnace for ferrous and nonferrous metals with Motor Blower attached. Prompt delivery. Address: The Harvey Furnace Co., 2935 St. Paul St., Baltimore 18, Md.

FOR SALE

1—Type BB 1, Size 225, Serial No. 563, Fisher Crucible Furnace, with 7 new crucibles. In excellent working condition. Call or write Kelly Foundry & Machine Co., Elkins, W. Va.

For Sale

CENTRIFUGAL COMPRESSORS

7000 CFM, @ 1¼ lbs. pressure, Ingersoll-Rand, type F S, driven by a 60 HP, Westinghouse 220/440 volt 3600 RPM motor.
2100 CFM @ 12 oz. General Electric with 10 HP 220/440 volt 3450 RPM motor.

Pressure Blowers

(2) 1200 CFM @ 11 oz. Buffalo, 9½" intake, 7" x 7½" outlet, with 7½ HP 3/60/1800 RPM motors.

THE MOTOR REPAIR & MFG. CO.,
1552 HAMILTON AVE., CLEVELAND, OHIO

FOR SALE

1—24-inch Davenport Jolt Roll-Over Draw Molding Machine
1—13-inch Jolt Squeeze International Molding Machine
1—10-inch Jolt Squeeze Adams Molding Machine

KRAUSE MANUFACTURING COMPANY
HUTCHINSON -:- KANSAS

FOR SALE

One second hand Stedman Type "B" 24" x 20" Rolling Ring Crusher with Chilled Liners, Manganese Rings and Cage Bars, Cast Iron Construction. Also one second hand Stedman Type "B" 24" x 20" Rolling Ring Crusher arranged for flat belt drive, all steel construction, having cast steel housing and liners. Machines in good operating condition and may be inspected at our plant.

BIRDSBORO STEEL FOUNDRY & MACHINE COMPANY
BIRDSBORO, PA.

FOR SALE

One used Nicholls Jolt Squeeze draw No. 18-44 Jolt Machine. Price $1,000.00. Address: **NEW HAVEN FOUNDRY, NEW HAVEN, MICHIGAN.**

FOR SALE

1—Steele Harvey metal melting furnace 22" dia. x 24" high covers, 6" fire brick lined, No. 30 crucible.

1—Melting furnace 28" dia. x 28" high with covers, 60 lbs. crucible cap.

1—36" dia. x 54" steel shell 6" fire brick lined soft metal melting furnace, with hand wheel operated bevel and spur geared tilting device, No. 96 simplex.

1—30" dia. x 28"—¼" shell 6" fire brick lined soft metal melting furnace with 320 lbs. cast iron pot.

THE BUCKEYE ALUMINUM COMPANY
WOOSTER, OHIO

FOR SALE

Cleveland model F sand cutter, No. 670, type 112-92, 84" spiral cutting cylinder, 36" in diameter, 101" between wheels, 5" wide, 6' diameter, equipped with 5 motors, 2 speeds forward, 2 speeds reverse 3-phase 60 cycle, 220V, AC Cable and Take up reel. Condition good.

American Machine Company 36 x 42 tumbling unit, serial A 5841. Bearings and motor newly reconditioned.

GILLETT & EATON, INC.
LAKE CITY MINNESOTA

FOR SALE

1—3000 pound Whiting U shaped Teapot Ladle, like new. Address: Box 586, The FOUNDRY, Cleveland 13, Ohio.

For Sale

REBUILT EQUIPMENT IN STOCK
IMMEDIATE SHIPMENT

(2)—¾" cap. Power Sprue Cutters.
(1)—10" Tabor Post Type Squeezer.
(2)—Heavy Duty double end U. S. Elec. Grinders 440-V-3-Ph-60-cy.
(1)—Pangborn type GD size No. 3 Sand Blast Barrel.

ELECTRIC MONORAIL HOISTS

Cap.	Make	Current	Remarks
(1)—½-ton	Detroit	220/3/60	Var. Speed
(1)—1-ton	LoHed	220/3/60	Single Speed
(2)—1-ton	Euclid	115-VDC.	Single Speed
(3)—1-ton	Shepard	230-VDC.	Var. Speed
(3)—2-ton	Shepard	230-VDC.	Var. Speed
(3)—2-ton	Shepard	230-VDC.	Two Motor
(1)—4-ton	Shepard	230-VDC.	Two Motor
(1)—6-ton	Sprague	230-VDC.	One Motor

SPECIAL: 2—1-ton Shepard Hoists, arranged for stationary mounting, 7½-HP. motor, 220/440-VAC. Var. Speed, separate controller, 32-ft. of cable, su.table for use as winches, car puller to operate furnace doors or elevator.
SPECIAL: 2—7½-ton Shepards, Fl. or Cage Operated, 230-VDC., 20-HP. hoist motor, 28/70-FPM. 10-HP. trolley motor, 350/400-RPM 40-ft. lift.

AIR COMPRESSOR

(1)—9 x 8 Chicago, N.S.B., cap., 178-CFM @ 100 lbs. with 25-HP., 220/440-VAC. motor and control.

BUCKETS

(2)—¾-yd. Hayward Electric 220-VAC.
(2)—1½-yd. Hayward Electric 230-VDC.
SPECIAL: 3-ton Size "P" Electromelt Steel Melting Electric Furnace, complete with 1500-K.V.A., Allis-Chalmers O.I.W.C. Transf. 13200/3/60-cy., all necessary control equipment, panels, etc. REBUILT, GUARANTEED, IMMEDIATE SHIPMENT.

OVERHEAD ELECTRIC TRAVELING CRANES

Cap.	Make	Span	Current
(1)— 3-ton	Shaw	30'0"	230-VDC
(1)— 2-ton	C. & M.	30'0"	220-VAC
(1)— 4-ton	Shepard	30'11"	230-VDC
(1)— 5-ton	Box	40'0"	230-VDC
(2)— 5-ton	Niles	40'0"	230-VDC
(1)—10-ton	Bedford	48'0"	230-VDC
(1)—10-ton	Whiting	80'0"	220/440-VAC
(1)—10-ton	Chesapeake	80'0"	230-VDC

(3)—3/5-ton J.b Cranes, 23'9" masts, 192" boom, wired and complete with 2 to 5-ton, one or two motor 230-VDC. hoists.
(1)—15/10-ton, 80'0" span, McMyler Gantry Crane, A.C. or D.C. suitable for 2-line bucket service.

WE OWN AND HAVE ALL THIS EQUIPMENT IN STOCK, IT IS OFFERED REBUILT IN OUR LARGE MODERN PLANT AND FULLY GUARANTEED.

T. B. MacCABE CO. 4304 CLARISSA ST.
PHILADELPHIA 40, PENNA.

CORE SAND MIXER

New Blystone model B-2½, 11 cubic feet capacity, clutch pulley drive. Available for immediate delivery.

DENNY & CLARK
910 N. Marshfield Ave. Chicago 22, Ill.

FOR SALE

Molding Sand Business consisting of complete modern mill, several leases, trucks, office equipment and laboratory. Located in Southern Indiana with ideal customer spread. Good reason for selling.

Box 617
The FOUNDRY Cleveland 13, Ohio

FOR SALE

Complete set of wood patterns for nine-inch cylinder molding machine, both portable and satisfactory, with blue prints covering machine work. Address: Box 603, The FOUNDRY, Cleveland 13, Ohio.

SCULLY Reconditioned Foundry Equipment

★ ALL SCULLY EQUIPMENT IS REBUILT AND OVERHAULED IN OUR OWN MACHINE SHOP

MOLDING MACHINES

JOHNSTON & JENNINGS

Jolt Roll-Over Draw Machines

No. 610, 24 x 30" table, 600 lbs. cap. @ 80 lbs. press., 10" pattern draw.

No. 815, 30 x 40" table, 1200 lbs. cap. @ 80 lbs. press., 15" pattern draw.

No. 918, 40 x 48" table, 2000 lbs. cap. @ 80 lbs. press., 18" pattern draw.

MISC. MOLDiNG MACHINES

No. 112 Arcade portable jolt roll-over and squeeze, pattern draw, table accommodates pattern plates up to 13 x 33"—9" draw, distance between uprights 36".

No. 602 Osborn jolt roll-over draw, portable, 24 x 30" flask cap., 900 lbs. cap. @ 80 lbs. press., 10" draw.

No. 28 Davenport jolt roll-over draw, 26½ x 39½" table-pattern draw 12"—jolt cyl. dia. 8"—1500 lbs. cap. @ 80 lbs. press.

Pridmore 30 x 42" power turn-over and drop Electrically operated 24 x 32" jarring machine, 2 HP 220V AC Motor.

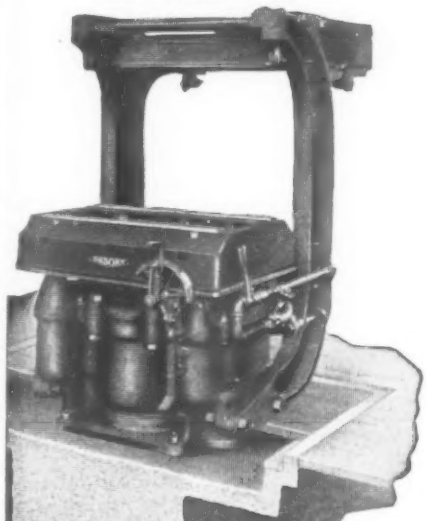
PLAIN AIR SQUEEZERS

Tabor stationary, 32" between rods, 10" dia. cyl. 18 x 18" table.

Davenport, 33" between rods, portable straddle type, 10" cyl. 14 x 20" table.

Tabor, portable, 32" between rods, 10" dia. cyl. 16 x 17" table.

OSBORN JOLT SQUEEZE & POWER STRIP



No. 703 OSBORN

(Similar to above excepting with roll-off)

No. 703-6 Osborn jolt squeeze and strip, 21 x 29" table, stationary. Length of opening in lifting frame 34", 6" pattern draw, 8" cyl. dia. 1000 lbs. jolting cap. @ 80 lbs. press. Distance from lifting frame to squeeze head 24¼", flask length 44¼" with roll-off conveyor.

No. 703-5 Osborn, same as above, excepting 17 x 35" table.

PLAIN JARRING MACHINES

60 x 60" Tabor, 14" dia. cyl., 8500 lbs. cap. @ 80 lbs. press.

42 x 60" Tabor, 13" dia. cyl., 7500 lbs. cap. @ 80 lbs. press.

JOLT SQUEEZE STRIPPERS

No. 113 Milwaukee, open end type, portable, 500-lbs. cap. @ 80 lbs., 6" draw, 16 x 36" table.

Osborn No. 82 STRIPPING PLATE JOLT SQUEEZER, 46" between rods, 10" draw, 1200 lbs. jolting cap., 1000 lbs. stripping cap., 24 x 36" table pin lifts 12" part one way, 36" the other.

Nicholls Type "D" stationary heavy duty, JOLT SQUEEZE & PATTERN DRAW, squeeze piston 14", jolt piston 6", draw 2-6"—distance between strain rods 40" take approx. 15 x 24" flask.

Osborn No. 550-22 pit type JOLT STRIPPER, stationary pin centers 16 x 32"—table 32 x 36".

No. 832 Milwaukee hand jolt and roll-over, foot draw, portable, 30" height pattern table, max. pattern draw 8", 15 x 32" table, max. flask size 24 x 32".

ELECTRIC SAND RIDDLES

Coombs Type "V" 21" dia. equipped with 110V AC single phase Motor.

Coombs "CS" 24" sq riddle, equipped with 1/3 HP 3/60/220-440V AC Motor.

Lowe Hi-Speed, 20" dia., equipped with 3/60/220-440V AC Motor.

POSITIVE PRESSURE BLOWERS

No. 4 Roots, 14 x 48" — 13 ft. displ. 14" top discharge, pulley drive.

No. 5½ Roots, 18 x 63"—18" dia. top discharge, arranged for motor drive with Link-Belt Chain (without Motor) on CI base plate.

No. 5½ Roots (High Pressure) 18 x 42½"—18 ft. displ. 2 lbs. press., belt drive, top discharge.

No. 6 Piqua, 21 x 60" — 35 ft. d.spl. 20" top discharge, single gear, mounted on bed plate (without motor).

Pangborn 6 ft. dia. TYPE EH-1 CABINET TABLE INSTALLATION, 5 ft. high partition, Abrasive Handling and Reclamation System, Belt and Bucket Type Elevator, Sandblast Pressure Tank.

AMERICAN SANDCUTTERS

Cleveland-American (similar to Model "K" 84" spiral cutting cyl., 36" dia., 92" between tractor wheels 5" face, 6' dia.—equipped with Cleveland 3-phase 60 cycle 220V AC Motors, Cable and Take-Up Reel.

American Model "CP" size 72, having 72" cutting cyl., 90" between tractor wheels, tractor wheels 50" dia., 5" face, equipped with Hercules Gas Engine.

OVERHEAD ELECTRIC TRAVELING CRANES

10-ton approx. 30'7" span, 3-motor type, Northern Electrical 115 V. DC Motors, Hoist 15 HP 750 RPM, Rack 3 HP 1200 RPM, Bridge 7½ HP 950 RPM, EC&M Controllers, cage oper., 24" double "I" Beams, cast iron truck ends, chain lifts.

1-ton Euclid 1-motor single "I" beam girder hand operated CRANE, equipped with Electric Hoist 3/60/440 V. AC Motor, approx. span 30 ft.

1-ton Detroit Type "H" Lohed Room, approx. 29 ft. span, 12" double "I" beam girders, 9 ft. lift, floor control Watson Induction Type "KH" 3/60/220 V. AC Motors, approx. 40" clearance.

3-ton MILWAUKEE 3-motor Type "C" GANTRY CRANE (suitable for 5-tons) 230 V. DC Motors, lattice type girders, structural end trucks, enclosed cage at one end, approx. span 31'6", lift 25 ft. overhang each side approx. 12 ft., single drum parallel with bridge girders, including ½ yd. single line perforated BUCKET for same.

ELECTRIC HOISTS

3-ton Link-Belt single point suspension with Top Hook (or can add Trolley if required). Floor operated, mechanical lowering brake, 18' lift, speed 18 FPM, equipped with 115 volts, DC motor, or can rewind for 220 V. DC service.

5-ton Shepard Form 1 Class B-6 equipped with 6 HP 220 V. DC motor, floor control, 15 ft. lift, speed 15 FPM.

ELECTRIC BUCKETS

2-Yd. Hayward ELECTRIC COAL BUCKETS equipped with Shepard Hoist.ng Unit, 10 HP, 230V DC Motor.

1½-Yd. Hayward Elec. equipped with Class "B" 6 HP 230V DC Electro Dynamic Motor—Hoist Cap. 8000 lbs.

1-Yd. Electric—equipped with D.C. Motor, dim. when closed 50" width, 72" length.

MISCELLANEOUS

Blystone 9-11 ft. MIXER, clutch pulley drive-side discharge, complete with 10 HP GE KT-751 220V AC 1800 RPM Motor.

Hausfeld Style 1000, 100# cap. stationary ALUMINUM FURNACE, with cast iron pot, gas-fuel oil.

No. 27-D Excelsior Single Spindle AUTOMATIC GRINDING AND POLISHING MACHINE, grinding cap. up to 60" sq., pulley drive (floor space required 9 x 12 ft.)

Universal SAND THROWER, stationary, on bed-plate, direct connected to GE 7½ HP 220V AC Motor.

SCULLY MACHINERY & EQUIPMENT CORP.

2031 WEST 74th STREET (Phone PROspect 8770) CHICAGO 36, ILLINOIS

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Service to Industry on

LUMBER

We don't claim to be miracle workers—yet we can look back over the last two war years and take certain pride in the fact that if Dougherty didn't have your lumber needs, you very rarely found it elsewhere.

Our service, as far as is humanly possible, has kept pace with industry's growing demands for lumber and our service on industry's specialized requirements has helped in many ways to expedite production. Timber, pattern lumber, flask and crating lumber is available NOW for all industrial needs—call that lumber number NOW!

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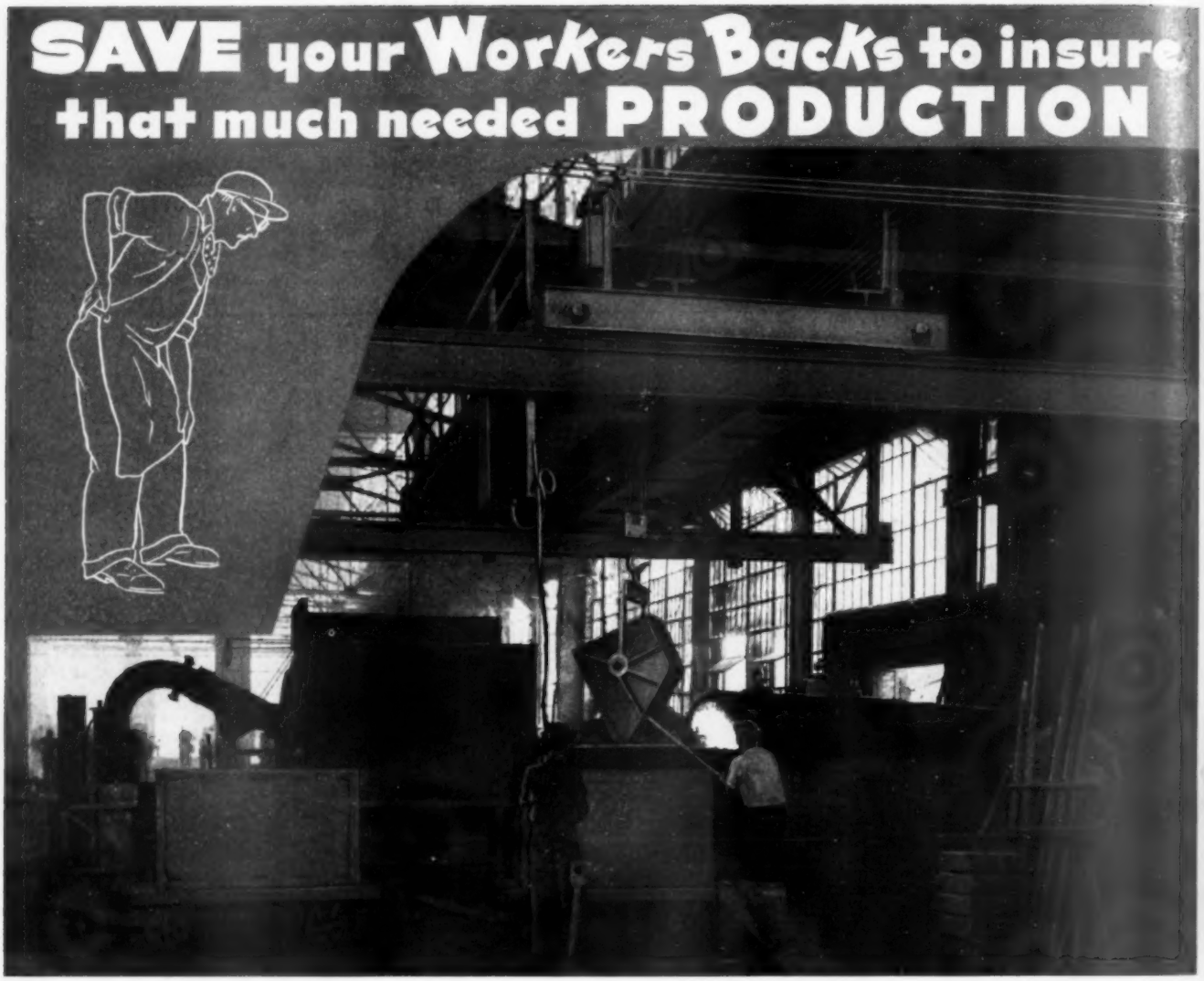
SAVE your Workers Backs to insure that much needed PRODUCTION



Transport Those Heavy Loads Over Hot Furnaces On Modern Electric Or Hand Operated Cranes

That's exactly what our customer has done in the above scene. All the hard heavy work of lifting shovels of scrap or heavy pigs into the malleable air furnace was eliminated with the Modern Three Motor Floor Operated Crane. Charge materials are brought in on bucket trucks and contents dumped into the malleable furnace with this crane. All hard labor is eliminated, charging time cut to a minimum, and it's a well paying installation too.

Modern electric cranes are designed for severe foundry service. Substantially built, all drive parts readily accessible and fitted with anti-friction bearings. Makes an ideal crane for yard service.

Let us quote you on your requirements.

MODERN EQUIPMENT COMPANY

PORT WASHINGTON, WIS., Dept. 208

Cupolas • Cupola Chargers • Lifetime Geared Ladles • Ladles • Electric Cranes
Metal Pouring Systems • Covered & Insulated Ladles • Improved Bottom Pour
Furnace Charging Cranes • Crane & Monorail Systems

MODERN EQUIPMENT CO.
PORT WASHINGTON, WIS

Why not use the Best?

"They meet every test . . . because they're the best"

Stevens

STAMPED STEEL LADLE BOWLS

are the best . . . there isn't another ladle bowl made that compares with them.

CHECK THESE FACTS

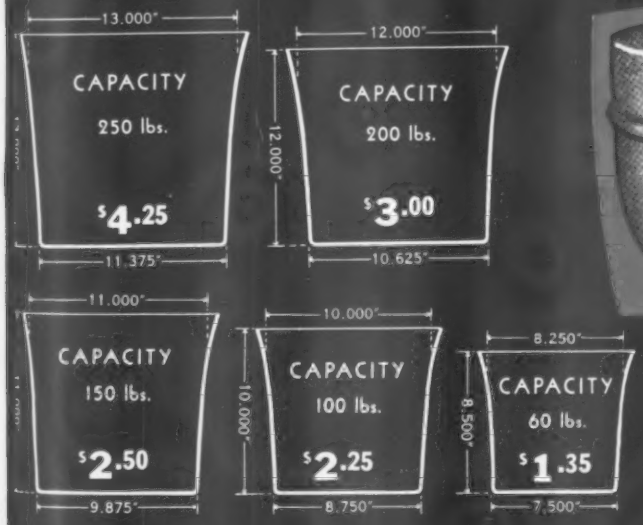
★ Every one of these bowls is deep drawn from a single sheet of SPECIAL ANALYSIS EXTRA HEAVY STEEL.

★ Uniform in size and shape.

★ First cost no more than for ordinary bowls . . . ultimate cost much less.

★ For jobs which require a flat, wide stream of metal, use Stevens Style "S" Ladle Bowl. The pouring lip can be formed in the lining and the stream of metal made to suit the job.

SPECIFICATIONS and PRICES FOR ABOVE LADLES



STEVENS STYLE S STAMPED STEEL LADLE BOWL

Capacity 60 lbs.

OUR LADLE EQUIPMENT LINE IS COMPLETE

★ Whatever type of bowl your work requires, we can supply your needs in various sizes and capacities. Our complete line includes:

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WORM-GEARED LADLES · CRANE LADLES · MIXING LADLES

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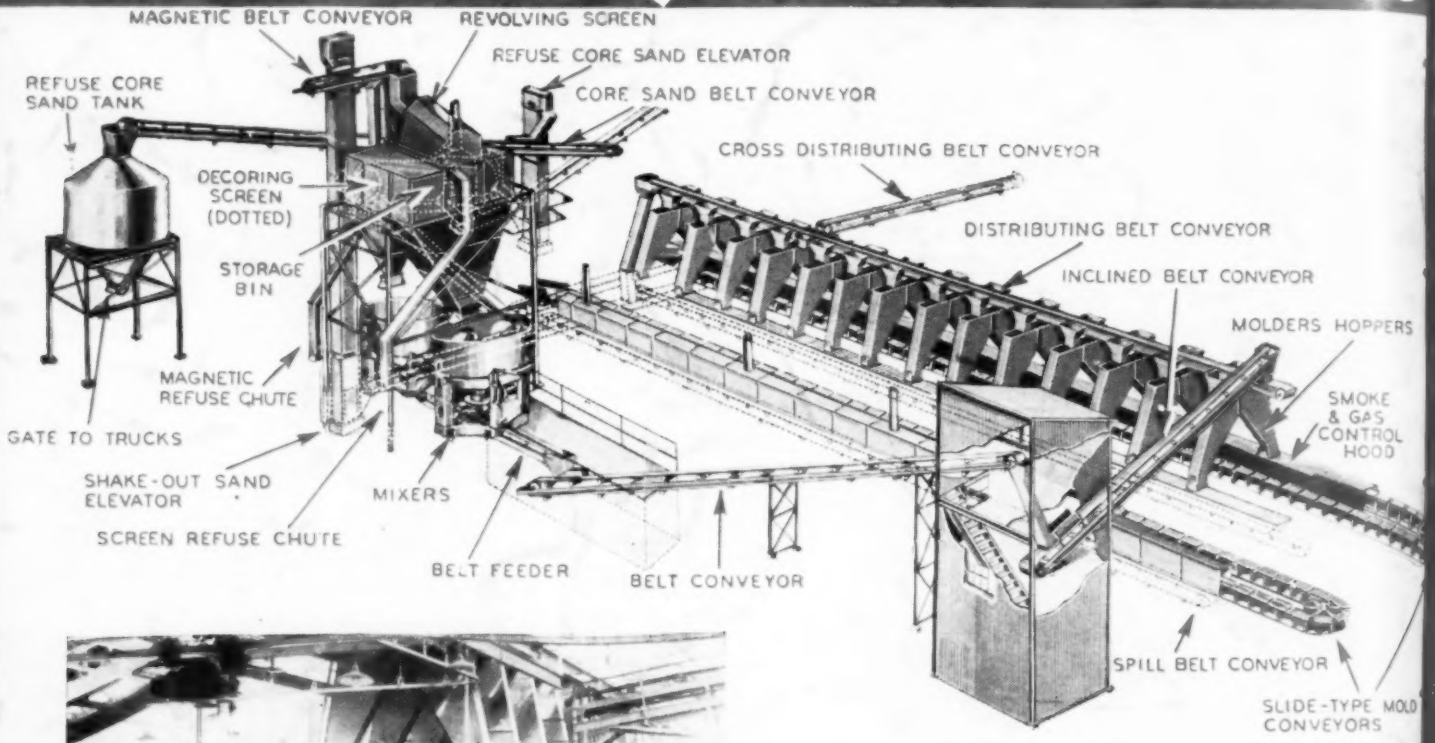
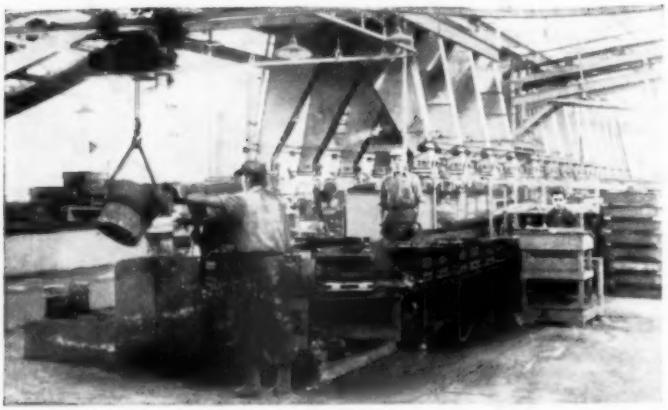
How an Eastern Foundry *Expanded Facilities for Greater Production of* QUALITY CASTINGS





Molders are served by two slide type mold conveyors. Pouring takes place while conveyors are moving, the pourer being located on a raised platform at one end of the conveyor, adjacent to the melting department. Poured molds pass into an enclosed chamber, where smoke and gases are controlled, on through to the vibrating shakeout screens.

★ ★ ★

Increased production with a reduction in flask equipment and a saving of two-thirds in floor space were the results accomplished by the original Link-Belt sand, mold castings handling equipment installed by this company in their New York State iron foundry in 1928.

Early last year with the need for a much greater production of electrical fittings, a completely new foundry was put into operation. Link-Belt sand preparation and sand, mold and castings handling equipment as illustrated here was again selected.

Link-Belt units, as used in the first installation, were again selected and augmented by new equipment of similar design. This was particularly true of the slide type mold conveyors which proved outstandingly successful in the original installation.

Two parallel lines of molding machines served by overhead sand hoppers. Each line is located over a floor grating with a belt conveyor beneath the floor to receive spill sand and return it to the system.

★ ★ ★

Let us send you further details on this and other Link-Belt material-handling and sand preparation installations which are speeding the production of better castings at lower cost in foundries of all types.

LINK-BELT COMPANY

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Offices, Factory Branch Stores and distributors in principal cities.

LINK-BELT CONVEYORS

AND PREPARATION MACHINERY